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WITH

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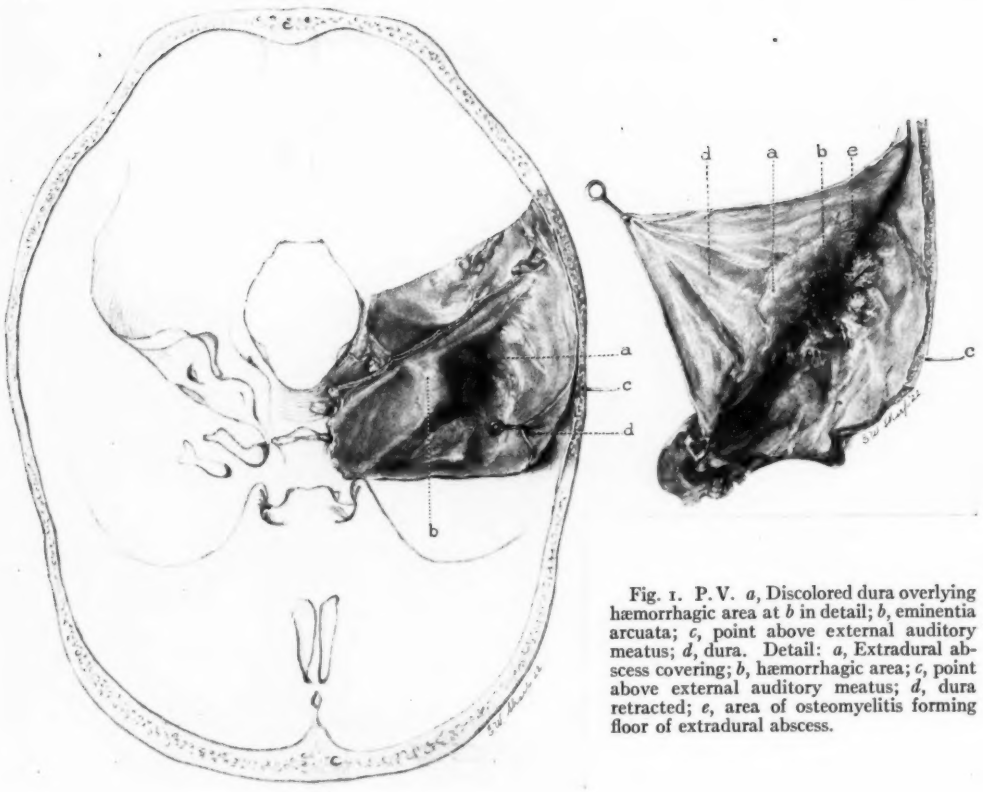

Fig. 1. P. V. *a*, Discolored dura overlying hæmorrhagic area at *b* in detail; *b*, eminentia arcuata; *c*, point above external auditory meatus; *d*, dura. Detail: *a*, Extradural abscess covering; *b*, hæmorrhagic area; *c*, point above external auditory meatus; *d*, dura retracted; *e*, area of osteomyelitis forming floor of extradural abscess.

Brain Abscess with Pathological Observations.—Charles Bagley, Jr.

SURGERY, GYNECOLOGY AND OBSTETRICS

AN INTERNATIONAL MAGAZINE PUBLISHED MONTHLY

VOLUME XXXVIII JANUARY, 1924 NUMBER 1

BRAIN ABSCESS WITH PATHOLOGICAL OBSERVATIONS[1]

BY CHARLES BAGLEY, JR., M.D., F.A.C.S., BALTIMORE

THE substance of these remarks is part of a study of twenty cases of brain abscess. Seventeen were operated on with a mortality of 47 per cent. Eight of the cases operated upon and three unoperated upon died and an autopsy was performed in eight of the eleven fatal cases. Points of interest are shown in the illustrations.

These illustrations have been selected for the purpose of showing: (1) some of the avenues of infection, particularly those through which the infection reaches the brain, of tympanic cavity inflammation, and of gunshot and traumatic injuries; (2) behavior of the brain with regard to the formation of the abscess wall after the introduction of infection. Case reports are not attempted, but a few clinical facts are added, that the pathological illustrations will not lack the value of a clinical background. Initials of patients are given that the material here may be connected with the full clinical history of the patient, which it is planned to publish later.

AVENUES OF INFECTION

The material illustrating avenues of infection has been arranged in four groups, some of which are subdivided:

Group I. Presence of an extradural extension of the primary focus, with (a) protrusion of the distended dura into the cranial cavity; (b) direct extension from the extradural abscess; (c) invasion from the extradural abscess along the blood vessels.

Group II. Secondary invasion of the brain along the blood vessels without extradural link.

Group III. Penetrating brain injury with infection by foreign body, deep, with or without stalk. (a) Path infected and open, hence long abscess stalk; (b) path healed, hence no abscess stalk.

Group IV. Abscess superficial and open, secondary to direct laceration and infection of brain tissue.

GROUP I.—PRESENCE OF AN EXTRADURAL EXTENSION OF THE PRIMARY FOCUS

In considering the extension of infection from the tympanic cavity and accessory nasal sinuses to the brain, the dura must be placed first in importance as a barrier. Osteomyelitis of the wall of any of the cavities adjacent to the dura is likely to result, if thorough drainage of the pus is not accomplished within a reasonable time. Further extension of the inflammation is prevented when the process reaches the dura, which, because of its fibrous architecture is capable of active proliferation. Because of this defensive reaction, the inflammation is limited to the extradural space for a period of sufficient length to justify its designation as one of the stages of extension of infection from the primary abscess to the brain.

It is important that this stage be recognized clinically, because if the accumulation of pus is not evacuated early, further extension will

[1] A presentation of lantern slides shown before the Southern Surgical Association, December, 1922.

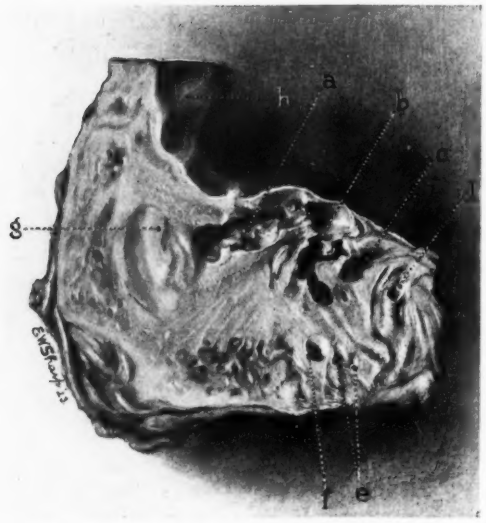

Fig. 2. P. V. A section through the temporal bone, shown in Figure 1. *a*, Mastoid antrum, seat of extensive suppuration, with osteomyelitis of its bony roof; *b*, tympanic cavity, also the seat of suppuration; *c*, hæmorrhagic extravasation; *d*, carotid artery; *e*, branches of the jugular vein; *f*, internal jugular vein; *g*, dura of the cerebellar fossa in close proximity to the suppurating antrum cavity; *h*, squamous portion of the temporal bone.

almost certainly occur. In no specimen of our material has this extradural accumulation been large, though several specimens demonstrate its occurrence. Extension from the extradural abscess in this series occurred in three different ways which have been arranged as subdivisions of Group I.

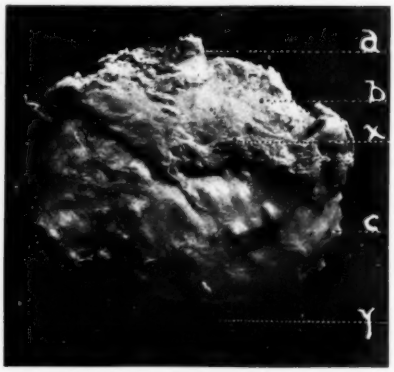

Fig. 3. R. L. Pedunculated dural abscess. *a*, Abscess stalk, point of attachment to dura; *b*, layer of cerebral tissue adherent to abscess; *c*, fibrous tissue wall of abscess; *x*, site of section shown in Figure 13; *y*, site of section shown in Figure 16.

The abscess shown in Figure 1 (frontispiece), a drawing of the temporal bone of P. V., may be considered typical of this extradural stage in the extension of the infection.

P. V., age 17. Left otitis media in early childhood, cured but purulent discharge from left ear again 3 weeks before admission. Left temporal lobe abscess for approximately 3 weeks. Meningitis, drainage of the abscess. Death.

This small extradural abscess was the result of necrosis of the roof of the tympanic cavity. The intracranial surface of the dura was not involved in the inflammation and there were no adhesions between the dura and the cortex. A cross section of this temporal bone (Figure 2) showed extensive suppuration of the tympanic cavity and antrum with osteomyelitis of their bony covering.

Fig. 4. L. F. Frontal view of brain with large abscess in right frontal lobe. *a*, Adherent dura of frontal lobe reflected toward mid line; *b*, perforation of dura; *c*, perforation in frontal lobe, which was continuous with *b* and formed the abscess stalk.

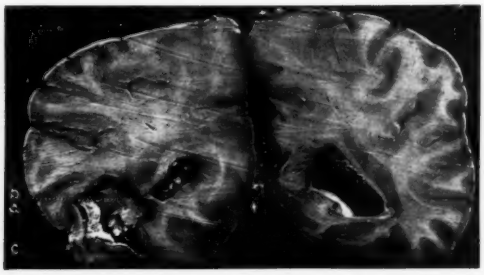

Fig. 5. P. V. Frontal section of a brain with left temporal lobe abscess. *a*, Abscess cavity; *b*, abscess wall and site of section shown in Figure 18; *c*, site of section shown in Figure 19.

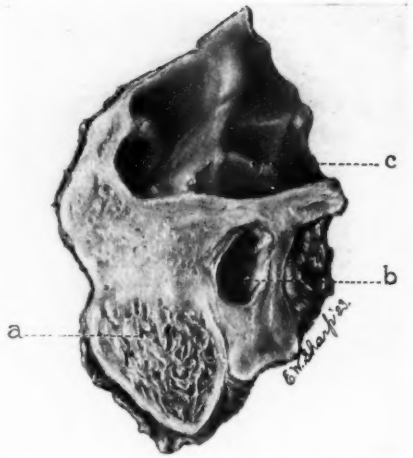

Fig. 6. P. V. A section through the temporal bone in Figure 1. *a*, Mastoid process, no evidence of suppuration; *b*, external auditory canal; *c*, squamous portion of temporal bone.

The specimen shown in Figure 3 was the result of extension by protrusion of the distended dura into the cranial cavity.

R. L., age 27. Pedunculated dural abscess, duration of approximately 4 months. Abscess removed without rupture. Recovery.

This abscess developed at the site of a necrosis of the occipital bone. The cause of the necrosis was not determined. The formation of the abscess differed from the usual extradural abscess in which the dura is merely depressed into the skull cavity. In this instance only a limited part of the dura pro-

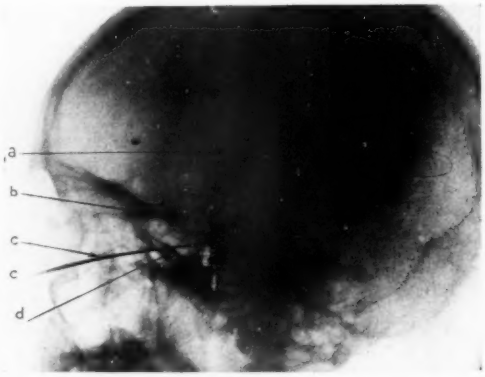

Fig. 8. E. M. *a*, Bone defect at site of subtemporal decompression; *b*, Metallic foreign body in left temporal lobe; *c*, probe passed through sinus marking tract through which foreign body passed; *d*, floor of middle fossa of skull.

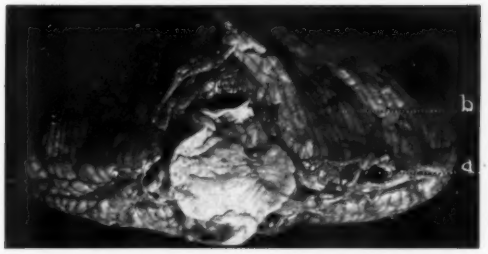

Fig. 7. R. W. Upper surface of cerebellum, with abscess in left hemisphere underlying *b*. A cross-section of the abscess is shown in Figure 24. *a*, Point of spontaneous evacuation of abscess into posterior fossa.

liferated and was distended like a flask, owing to the slowness of the accumulation of pus.

Direct extension from the dural abscess is shown in Figure 4.

L. F., age 20. Influenza 4 months before admission, followed by right frontal sinus inflammation. Right frontal lobe abscess; probable duration 2 months. Drainage of abscess. Death.

After necrosis of the posterior wall of the frontal sinus, a condition revealed at operation, there must have been an extradural abscess as shown in Figure 1. The center of the inflammatory area of the dura was broken down and there was a direct communication between the extradural abscess and the frontal lobe, evidently through a local adhesion between the dura and the frontal lobe preventing the spreading into a general meningitis. The perforations shown at *b* and *c* formed the stalk of a large frontal lobe abscess.

An abscess, the result of invasion from an extradural abscess along the blood vessels, is shown in Figure 5, marking the further extension from the extradural abscess shown in

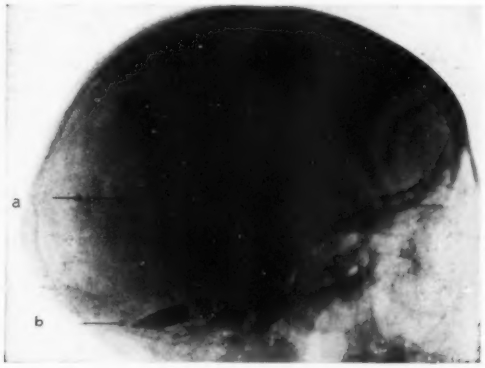

Fig. 9. P. L. *a*, Small skull defect, site of entrance of machine gun bullet seen at *b*.

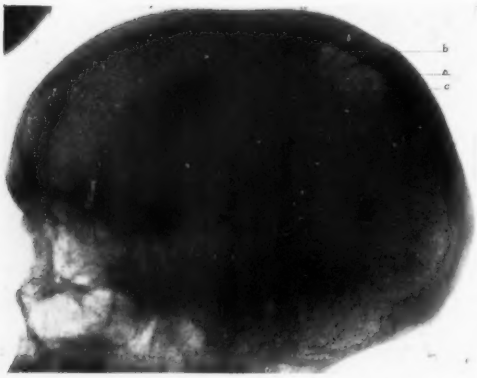

Fig. 10. W. F. M. *a*, Skull defect, resulting from gunshot injury; *b*, large indriven bone fragments; *c*, small bone fragments, the center of an abscess.

Figure 1. The meninges between this temporal abscess and the extradural abscess were

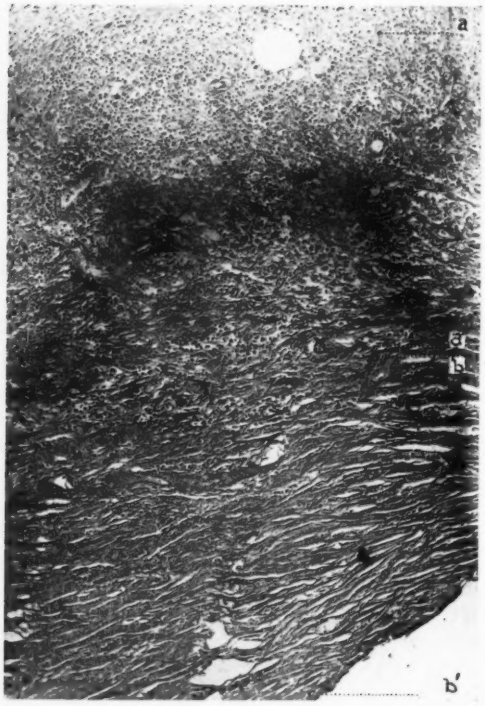

Fig. 12. W. F. M. Section of wall from *b* in Figure 11. *a* to a^1, Inner layer of abscess wall, showing young fibrous tissue elements; *b* to b^1, outer layer of abscess wall, showing adult fibrous tissue. ×85.

Fig. 11. W. F. M. *a*, Bone fragments shown at *c* in Figure 10; *b*, fibrous tissue abscess wall and site of section shown in Figure 12.

entirely free from inflammatory reaction. From the extradural abscess, or perhaps from the suppurating bone cavity, the inflammation seems to have been carried (as described under Group II) along a vein and the superior petrosal sinus into the substance of the temporal lobe.

The formation of an extradural abscess as a first link of cerebral infection must be fully appreciated, as adequate treatment of the primary lesion at this stage may prevent the infection from extending to the cerebral tissue. Extensive suppuration of the tympanic cavity and mastoid antrum with osteomyelitis of their bony roof occurs in chronic cases without involvement of the mastoid process, so that symptoms of mastoiditis need not occur; for example in Figure 6, the mastoid process of the temporal bone shown in Figure 1 is free from suppuration. Had symptoms of mastoid involvement appeared, the process would have been opened and the suppurating cavity in the bone, and perhaps the extradural abscess, adequately drained. Such a course was pursued with satisfactory results in the following case:

J. A. S., age 38, had purulent discharge from the left ear since his twelfth year. Headache and dizziness were troublesome for 6 months before operation. A mastoid operation revealed extensive necrosis in the neighborhood of the antrum, and after the operation there was free drainage of pus from above the antrum. The postoperative course was satisfactory until the eleventh day when there was frontal headache with mental confusion, slight aphasia, occasional twitching of the right shoulder girdle muscles, and gradually increasing stupor. As an exploring needle introduced into the left temporal lobe did not reveal pus, it was

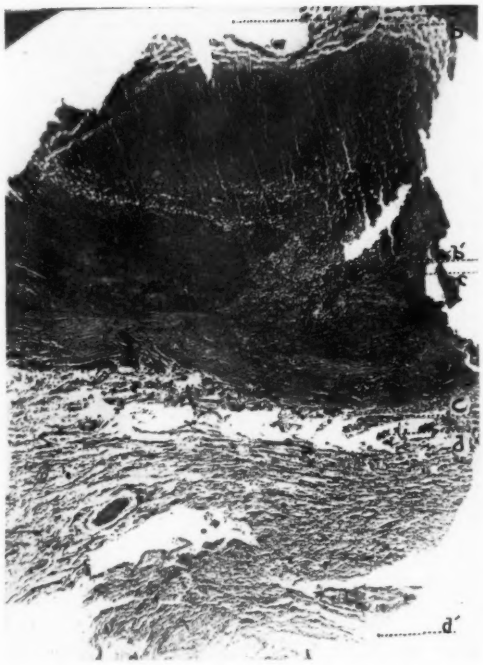

Fig. 13. R. L. Section at *x* of wall of abscess shown in Figure 3. *a*, Abscess cavity; *b*, necrotic tissue covering inner surface of abscess wall; *c*, abscess wall shown also in Figure 14; *d*, brain tissue, the site of active glial proliferation. ×15.

Fig. 14. R. L. Higher magnification of a section from *c* in Figure 13. *a*, Adult fibrous tissue strands; *b*, young fibrous tissue elements. ×325.

concluded that the cerebral symptoms were due to œdema secondary to the extradural abscess rather than to an extension of the infection. A decompression was done—the value of which lay in the relief of intracranial pressure—while the inflammatory process was checked by drainage of the extradural abscess through the mastoid antrum, with complete recovery.

External drainage of the area of bone necrosis, however, did not prevent the formation of the abscess shown in Figure 3. It is possible that the drainage diminished the amount of pus to be taken care of by the abscess wall to a point where the proliferation of fibrous tissue could keep pace with the distention.

It is probable that the inflammation extends directly from the extradural abscess more frequently than by the other methods described. The tract between the abscesses in some instances remains patent and offers a means of spontaneous evacuation of the brain abscess. In one case there was a history of chronic otitis media for 14 years, the drainage from the canal varying in amount. At times it was profuse, extending in a small stream from the canal and over the side of the face for a period of several hours. For 3 weeks prior to admission there had been very little drainage, but signs of serious increase of intracranial pressure terminated in respiratory collapse. While artificial respiration was being carried on preparatory to draining the abscess, there was a free discharge of foul pus from the canal, so that further evacuation was not undertaken.

In spite of this spontaneous drainage, death resulted from the serious medullary disturbance. At autopsy there was found a sinus extending from the tympanic cavity to a temporal lobe abscess.

GROUP II.—SECONDARY INVASION OF THE BRAIN ALONG THE BLOOD VESSELS WITHOUT EXTRADURAL LINK

The superior petrosal sinus, receiving the veins from both the tympanic cavity and the cortex of the temporal lobe, constitutes an indirect vascular link through which infection may extend. The lateral sinus may likewise form a link between the mastoid cavity and

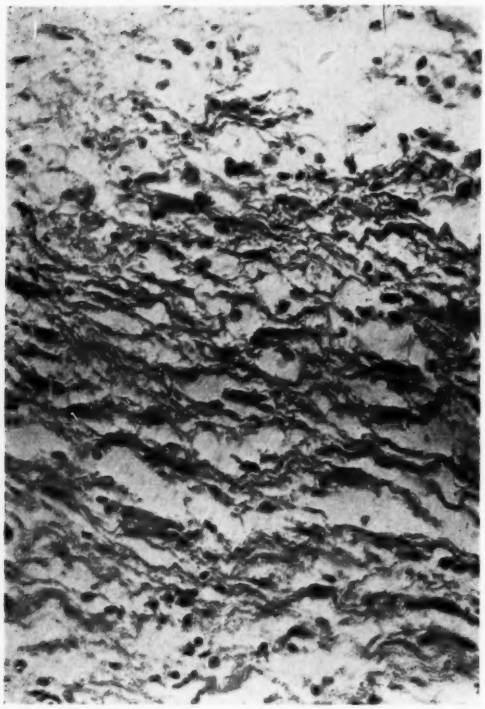

Fig. 15. R. L. A higher magnification of *d* in Figure 13, showing neuroglia fibrils. ×325.

Fig. 16. R. L. Section at *y* of wall of abscess shown in Figure 3. *a*, Abscess cavity; *b*, necrotic substance covering inner surface of wall; *c*, young fibrous tissue elements; *d*, adult fibrous tissue; *e*, site of section shown in Figure 17. ×15.

the cerebellar hemisphere. The exact method of extension of infection along the blood vessels cannot be outlined except where there is a thrombosis of the sinus, in which case the infected content of the sinus may be dammed back into its tributaries, and thereby carry organisms into the poorly resistant cerebral tissue. It is probable that merely a condition of phlebitis with retardation of the blood current may cause this forcing back of infected material. The correctness of this explanation can be determined only by further observation; the facts being that abscesses occur in the temporal lobe and cerebellar hemisphere secondary to tympanic cavity and mastoid inflammation without visible connecting tracts, and that there exists the indirect anatomical connection stated above.

An illustration of an abscess formed in such manner is given in Figure 7.

R. W., age 15. Left otitis media, mastoiditis, and cerebellar hemisphere abscess. Probable duration of abscess 3 weeks. Streptococcus infection. Drainage. Death.

There is no evidence of involvement of the meninges, though the left cerebellar hemisphere contained a large abscess; the infection evidently having reached the deep substance of the cerebellum along the blood vessels.

GROUP III.—PENETRATING BRAIN INJURY WITH INFECTION BY FOREIGN BODY, DEEP, WITH OR WITHOUT STALK

Penetrating wounds, complete or partial, are prone to infection at any point along the tract. Experience in the front line hospitals proved the necessity of thorough cleansing of such wounds with a view to removing all devitalized tissue and foreign material, and when this was accomplished within a few hours after the injury, primary closure of the wound was possible. When the penetration was incomplete, foreign bodies were often lodged

Fig. 17. R. L. Higher magnification of section at *e* in Figure 16 showing firm fibrous tissue strands. ×300.

at such a depth in the brain substance that their removal was not possible at the front line hospital. In addition, the stress of work at the front resulted in many cases being evacuated to the rear with incomplete operations. As a result of these conditions, cases were returned to this country, showing various types of cerebral lesions due to foreign bodies. In some, the foreign bodies were encapsulated and the healing was complete; in others, a discharging sinus extended from the foreign body in the substance of the brain to the skull surface, serving to prevent the accumulation of pus at the site of the foreign body; in others, the tract remained open but the formation of pus was in excess of the amount discharged through the sinus so that an abscess resulted; and in still others, the tract healed, and an abscess formed in the neighborhood of the foreign body.

An abscess with a path infected and open, forming a long abscess stalk, is shown in Figure 8.

E. M., age 25. Shell fragment entered temporal lobe through left malar region, August 17, 1918. Five months later symptoms of brain abscess. Left subtemporal decompression. Abscess drained, May 23, 1919. Recovery.

The tract through which the metallic foreign body entered the temporal lobe is shown in the X-ray photograph and is marked by the probe at *c*. This

Fig. 18. P. V. A section from *c* in wall of abscess shown in Figure 5. *a*, Abscess cavity; *b* to b^1, necrotic substance on inner surface of abscess wall; *c* to c^1, abscess wall; *d* to d^1, brain tissue; *e*, thin wall blood vessels; *f*, framework of abscess wall consisting chiefly of fibrous tissue proliferated from the blood vessels. ×85.

tract remained open and continued to discharge pus from the abscess cavity from the time of the injury until the operation.

An abscess in which the path of the bullet healed, leaving no abscess stalk, is shown in Figure 9.

P. L., age 30. Wounded, September 27, 1918. Drainage of abscess and removal of bullet, May 10, 1919. Recovery.

The abscess cavity is cut off from the wound of entrance by healing of the tract which extended through the occipital lobe and tentorium into the right cerebellar hemisphere.

The discharging sinus in the case of E. M. no doubt prevented the formation of the temporal lobe abscess for a number of months, and would have been more effective but for the effort made to have this tract heal, as its connection with the foreign body was not

Fig. 19. P. V. A section from *b* in wall of abscess shown in Figure 5. *a* to a^1, Inner layer of abscess wall; *b* to b^1, hæmorrhagic extravasation in abscess wall; *c* to c^1, outer portion of abscess wall, showing extensive vascular proliferation and numerous punctate hæmorrhages. ×85.

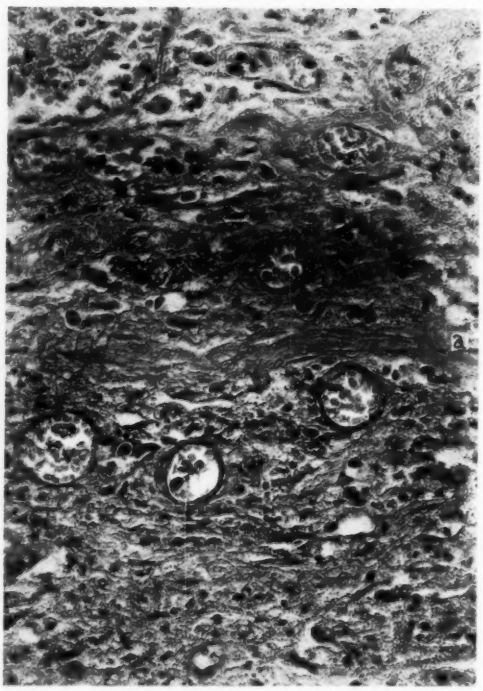

Fig. 20. W. F. M. Section from an abscess wall similar in type to that shown in Figure 18, but of longer duration. *a*, Small band of adult fibrous tissue. ×325.

considered. The abscess was finally drained through part of the original tract, for after its communication with the abscess was discovered, an incision in the temporal region exposed the proximal end of the tract just below the floor of the middle fossa of the skull, at which point very satisfactory drainage was obtained. The abscess was large, with extensive destruction of cerebral tissue, which resulted 3 years later in circulatory disturbance and impairment of function.

The other patient cited in this group was without symptoms of cerebellar disturbance. Removal of the foreign body was advised because of its size and the likelihood of cyst formation with destruction of cerebellar tissue. When the cerebellar cortex was opened there was a flow of pus which contained staphylococci.

GROUP IV.—ABSCESS SUPERFICIAL AND OPEN, SECONDARY TO DIRECT LACERATION AND INFECTION OF BRAIN TISSUE

Abscesses developing in neglected cases of compound fracture of the skull in which the surface opening is sufficiently large to permit a fairly free drainage of pus, often tend to do well when the foreign material is removed and drainage established. In these cases the encephalitis which follows the injury is localized and circumscribed by the proliferation of the neighboring mesoblastic tissue. Here again the dura plays an important rôle. In some cases at least the ragged dural flaps, dipping into the disorganized cortex, proliferate and completely shut off the foreign material from the brain, so that the resulting abscess is essentially extradural.

In the X-ray photograph in Figure 10 are seen shadows of the bone fragments extending in from the rim of the skull defect.

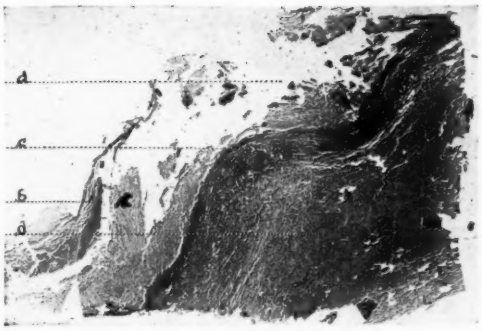

Fig. 21. L. F. A section from the wall of the abscess shown in Figure 4. *a*, Abscess cavity; *b*, disorganized tissue of inner abscess wall and site of section seen in Figure 23; *c*, abscess wall; *d*, brain tissue adjacent to the abscess wall. ×6.

W. F. M., age 25. Machine gun bullet wound, October 5, 1918. Bullet only removed at front line hospital. Wound unhealed; constant drainage of pus. Operation: Removal of firm wall abscess containing bone fragments, May 31, 1919. Death.

Fibrous tissue surrounding the large bone fragments at *b* formed the stalk of a thick walled abscess, in the center of which were contained the small fragments seen at *c*. The abscess is seen in Figure 11. The thick fibrous wall surrounding the fragments, as seen in Figure 10, must have been due to proliferation of fibrous tissue carried in with the bone fragments as the mass extended deep into the substance of the hemisphere entirely out of reach of any considerable amount of fibrous tissue. The character of the wall cannot be attributed to the long duration alone, as other abscesses in the hemisphere, the result of the same injury, showed almost complete lack of fibrous tissue elements.

Behavior of the Brain with Regard to the Formation of the Abscess Wall after the Introduction of Infection

The term abscess indicates a circumscribed accumulation of pus, and in this way the lesion under discussion, suppurative encephalitis, differs from the diffuse type of cerebral inflammation which is not amenable to surgical treatment. Only the end-results of the inflammatory process, namely, the abscess wall, will be treated in this paper. (1) The wall of the abscess is the most important factor in determining the outcome of well managed brain abscesses. As in all other inflammatory lesions the wall formation depends first upon the type of infecting organism, one of low virulence causing a more gradual accumulation of

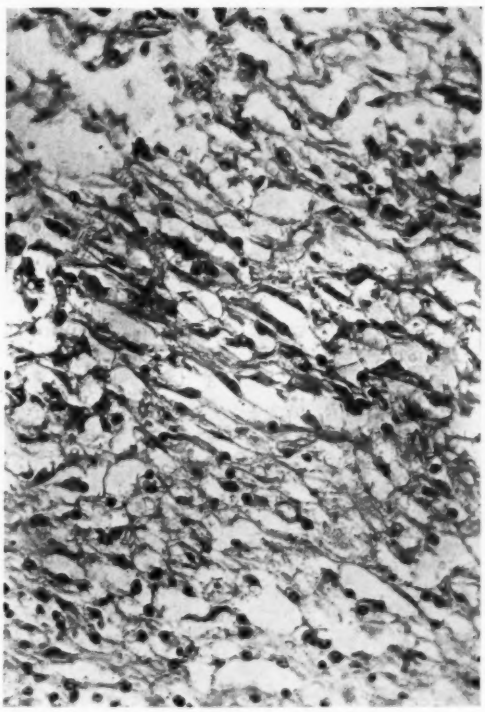

Fig. 22. L. F. A higher magnification of wall of abscess seen in Figure 21 showing the membrane to consist of delicate fibrils. ×325.

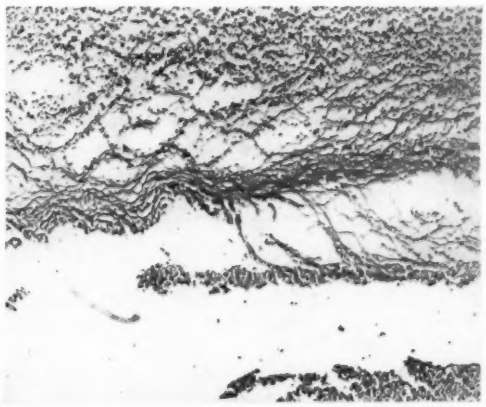

Fig. 23. L. F. Section of the innermost portion of abscess wall in Figure 21. Because of the necrosis the cellular elements have fallen out, leaving the delicate fibers in plain view. ×85.

Fig. 24. R. W. Cross section of cerebellum seen in Figure 7. *a*, Abscess cavity; *b*, area of hæmorrhagic extravasation, the result of thrombosis; *c*, site of section shown in Figure 25; *d*, site of section seen in Figure 26.

pus than one of greater virulence thus allowing sufficient time for the protective reaction of the tissue; (2) the resistance of the infected tissue is important, which protective reaction takes place principally in two kinds of tissue, fibrous mesoblastic and glial epiblastic. The fibrous tissue is far more effective but, unfortunately, is almost unavailable in the deep substance of the brain where glial tissue must suffice. In addition, it is influenced by the method of infection as shown in the first part of this paper.

Abscesses of long duration may have walls of greater thickness, but it is more likely that the duration is long and the wall thick because of the character of tissue available for proliferation.

TYPES OF ABSCESS WALL

Type I. Dense fibrous mesoblastic tissue wall.

Type II. Fairly firm wall, containing some fibers proliferated from neighboring mesoblastic tissue.

Type III. Walls of varying thickness the result of glial proliferation.

Type IV. Walls showing no evidence of a protective reaction.

Type I.—Dense Fibrous Mesoblastic Tissue Wall

If fibrous tissue is available for the abscess wall, it takes first place in the formation of the protective membrane. The meninges,

Fig. 25. R. W. Section from *c* in Figure 24. Note the large and small areas of thrombosis. ×85.

constituted largely of fibrous tissue, act as a barrier to pus (as in extradural abscess formation) and may furnish tissue for active proliferation and the walling-off of infection, even though the membranes be severely traumatized. Figures 11 and 12, for example, show the result of proliferation after a smashing skull injury. Figure 11 shows the firm wall abscess removed from W. F. M. in cross section. Figure 12, a photomicrograph, shows the wall to be made of mesoblastic fibrous tissue.

A very unusual reaction of the dura appears in Figures 12 to 17, photomicrographs of a large abscess of 4 months' duration, which was confined entirely within the limits of the dural tissue. In Figure 13, the same abscess as shown in Figure 3, the firm fibrous tissue wall was the result of proliferation of the slowly distending dura. The next figure, Figure 14, shows adult fibrous tissue strands and young fibrous tissue elements in this same abscess. Figure 16 shows the tensile quality of the fibers constituting the wall of the abscess, for a few strands were sufficient to protect the abscess against rupture. The quality of these strands is shown in Figure 17. Beyond the fibrous tissue wall there was neuroglial proliferation as shown in Figure 15. This latter

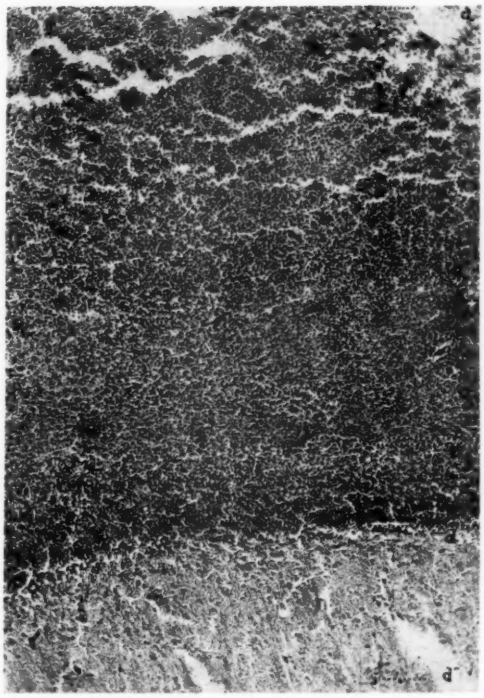

Fig. 26. R. W. Section from *d* in Figure 24. *a* to a^1, Necrotic tissue surrounding the abscess cavity; *b* to b^1, nervous tissue beyond the area of necrosis; *c* to c^1, layer of granular cells of the cerebellum; *d* to d^1, molecular layer of the cerebellum. ×85.

Fig. 27. D. F. A transverse section through occipital pole of brain. *a*, Primary abscess with firm wall; *b*, secondary abscess cavity; *c*, occipital pole of lateral ventricle.

reaction of cerebral tissue, of little importance in this case, is the main protective reaction in the wall of the abscess designated as Type III in this paper. The similarity between Figure 15 and Figure 22 is striking.

It is evident that the method of infection and the propinquity of mesoblastic tissue to the site of infection influence greatly the above-described formation of an abscess wall.

Type II.—Fairly Firm Wall Containing Some Fibers Proliferated from Neighboring Mesoblastic Tissue

The type of abscess wall shown in Figure 18, while not the most valuable, represents the usual form of reaction when the infection occurs deeper than the fibrous tissue coverings. The chief reaction takes place in the glia, but this is augmented by proliferation from the mesoblastic elements of the blood vessels. In addition to the availability of the mesoblastic tissue, the quality of the resulting wall is likely to improve somewhat with the duration of the process. In our specimens, all of which were of less than a year's duration, the fibrous tissue proliferation reached a stage in no sense approximating the density of the wall shown under the heading of Type I. In Figure 20 the small band of fibrous tissue represented the most advanced stage of the fibrous tissue proliferation of an abscess wall which had existed as long as the wall shown in Figure 11. Hassin[1], however, described a wall of 8 years' duration in which the outer layer of the abscess wall was made up of adult fibrous tissue strands.

The question of time necessary for the proliferation of an abscess wall is an important one. It is certainly unusual for an abscess to exist for a period longer than a few months and walls of this type may be formed with great rapidity, the history of the abscess

[1] Hassin, G. B. Histopathological studies on brain abscess. Med. Rev., 1918, xciii, 91–96.

Fig. 28. P. V. Transverse section through the occipital pole of the brain shown in Figure 5. *a*, Occipital pole of the lateral ventricle converted into abscess cavity with necrotic wall; *b*, area of encephalitis, tract of evacuation of pus from the ventricle cavity to the subarachnoid space; *c*, thickened pia-arachnoid; *d*, site of section shown in Figure 29.

shown in Figure 18 indicating that the wall was formed within a period of 3 or 4 weeks. The hæmorrhages shown in Figure 19 were no doubt due to the very active vascular proliferation in the soft cerebral tissue.

Type III.—Walls of Varying Thickness, the Result of Glial Proliferation

Walls formed almost entirely of glial fibrils may be very heavy, but because of the delicate character of the fibrils the wall is not so resistant as one in which there is fibrous tissue. In Figure 21 the wall was visible macroscopically and in this picture of low magnification has the appearance of a thick, limiting membrane, but the delicate quality of the tissue is shown in Figure 22. The relative value of this type wall and the firm fibrous tissue wall is perhaps best shown in Figure 13, in which there is a firm fibrous tissue wall at *c* and at *d*, the adjacent cerebral tissue with glial proliferation. A photomicrograph of *d*, given in Figure 15, is similar to the abscess wall shown microscopically in Figure 22.

The neuroglial fibrils are again well shown in Figure 23, which was taken from the innermost part of the abscess wall. A large part of the cellular element has fallen out because of the necrosis, leaving the fibrils in plain view.

Type IV.—Walls Showing no Evidence of a Protective Reaction

Figure 24 shows an abscess which was the result of a virulent streptococcus planted deep in the substance of the cerebellar hemisphere. There is no evidence of a protective reaction and the lesion marks an intermediate stage between an encephalitis and the usual abscess formation, for though suppuration occurred there was no true barrier between the pus and the brain tissue. At *b* in Figure 24 there is an area of hæmorrhagic extravasation, the result of thrombosis, which is also well shown in Figure 25, the destructive process entirely replacing the usual proliferative reaction. The merely necrotic end-result of the destructive process is shown in Figure 26.

Abscesses of this type also occur as secondary lesions to firm wall abscesses. In Figure 27 the primary abscess has a thick wall, the building of which, no doubt, required several weeks, but the extension from this abscess was doubtless more recent due to escape of pus into the substance of the occipital lobe, an invasion altogether too sudden to allow the slowly proliferating glial tissue to form a protecting membrane.

D. F., age 29. Gunshot wound left hemisphere, July 14, 1918. Constant drainage of pus from the wound. Drainage of abscess, June 22, 1919. Death, June 30.

The architecture of the wall of the primary abscess is similar to that described under Group II. The firmness of the wall and heavy consistency of its content indicate a long duration. At *b*, however, is a larger abscess cavity with soft necrotic walls evidently due to a more recent extension from the original abscess.

Figure 28 shows an abscess, also the result of extension from the firm wall abscess, as seen in Figure 5. There was evidently leakage of pus into the occipital pole of the ventricle which was shut off anteriorly from the remaining part of the hemisphere ventricle so that the occipital pole was converted into an abscess cavity. Extending from the ventricle to the inferior surface of the brain, an inflammatory tract marks the site of the escape of pus into the subarachnoid space.

Figure 29 is a section from the ventricle wall of the specimen shown in Figure 28 illustrating the poor quality of the abscess wall, which consists only of necrotic brain tissue entirely incapable of acting as a barrier to the pus content in the cavity.

The escape of pus from the abscess into the ventricle is a very common method of termination of neglected abscesses, but the conversion of a portion of the ventricle into an abscess cavity as shown in Figure 26, is certainly an uncommon reaction. The formation of secondary abscesses may be due to the ineffectiveness of an abscess wall as a barrier to constantly accumulating pus, or to organisms, so that such extension is dependent upon the duration of the abscess and the virulence of the organism producing it.

Summary

The clinical course of a brain abscess varies according to the infecting organism, the channel through which this organism reaches the brain, and the location of the infection in the brain substance as regards mesoblastic and epiblastic tissue.

This pathological study has been made as a basis for further consideration of the clinical data concerning these abscess cases.

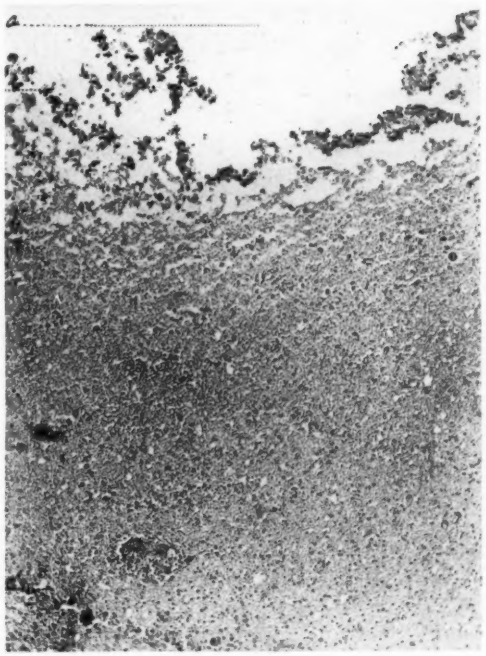

Fig. 29. P. V. Section of the abscess wall at *d* in Figure 28. *a*, Abscess cavity; *b* to b^1, necrotic brain tissue surrounding pus; *c* to c^1, brain tissue beyond the necrotic zone. ×85.

Note.—This work has been done in the Neurological Laboratory of the Phipps Psychiatric Clinic, Johns Hopkins University, and has been greatly facilitated by the interest and co-operation of Dr. Adolf Meyer. I am much indebted, also, to Miss Cecilia Bisson for the histological and photographic preparation of the material.

DIVERTICULUM OF THE URINARY BLADDER

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THE remarkable recent advances in diagnosis and surgical approach in cases of lesions of the kidney, has been closely paralleled in the recognition and treatment of surgical diseases of the urinary bladder, especially in cases of diverticulum. Until a few years ago diverticulum of the bladder was known only in the necropsy room, or was occasionally discovered during exploration of the bladder for other lesions. Durrieux, in 1901, was able to collect only 194 cases from the literature; most of these were from necropsy protocols. In 1906 Young found, in the literature 5 cases in which a diverticulum had been excised. He added to these cases 3 of his own. Six years later Lerche found 14 published cases of excision; he added one case to the list.

In the earlier cases treated surgically the condition was often discovered accidently, and the operation was carried out without consideration of the complicating lesion, and at times, of marked infection. The mortality was high and the operative results were only fair. Recent methods of urological diagnosis, however, make it possible to recognize the disease, the associated lesion, and the infection, and to suggest the type of surgical procedure which will give the most satisfactory results in a given case.

ETIOLOGY

Vesical diverticula are probably due primarily to embryological defects in the bladder, either a weakening of the musculature, usually at the base of the bladder, or a definite hiatus in the wall of the bladder. Targett asserts that it is due to an interruption of the muscular fibers in the base of the bladder by the entrance of the large vesical arteries in this region. The actual distention and dilatation of the sac probably result in most cases from obstruction to the outlet of the bladder. Anschuetz says that most of the diverticula are of the pulsion type, occurring in congenitally weakened parts of the bladder Diverticula are often seen in young children and occasionally in the fetus. In a five months' embryo, seen at the Mayo Clinic, two definite diverticula were found in the region of each ureteral orifice. The one near the right orifice was composed of all the coats of the bladder and was 1 centimeter in depth (Fig. 1). Lennander reported a case in an infant of 21 months; the diverticulum apparently was caused by obstruction from a severe phimosis. Apparently some embryological malformation is essential to the development of diverticula. Not all cases of obstruction of the lower urinary tract in fetal life, or in early infancy, cause sacculation. Marked phimosis, or other types of urinary obstruction are occasionally seen in the fetus or in early infancy, causing distention of the bladder, hydro-ureter, and fatal hydronephrosis, without evidence of vesical diverticula. Watson, who observed the vesical cavity in the progressive development from early fetal life to birth, noted a congenital predisposition to diverticula. He says: "Their clinical recognition during adult life is hastened and their dimensions greatly increased by increased vesical distention or increased activity of the bladder musculature." Kelly says: "Diverticula of the bladder are usually formed from small pre-existing pouches or hernia in the bladder which become enlarged by pressure and later come into prominence through stagnation of urine and inflammation." According to Hinman, diverticula result from anatomical, pathological, and mechanical factors, and in this sense the condition is acquired. He says: "A mild chronic urinary obstruction in association with the necessary anatomical or pathological predisposing condition of the bladder wall is particularly conducive for the development of diverticula."

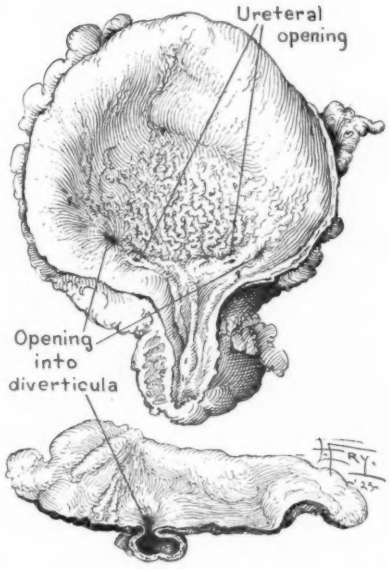

Fig. 1. Diverticula of the bladder in a 5 months' embryo. The sac on the right side involved all the layers of the bladder wall.

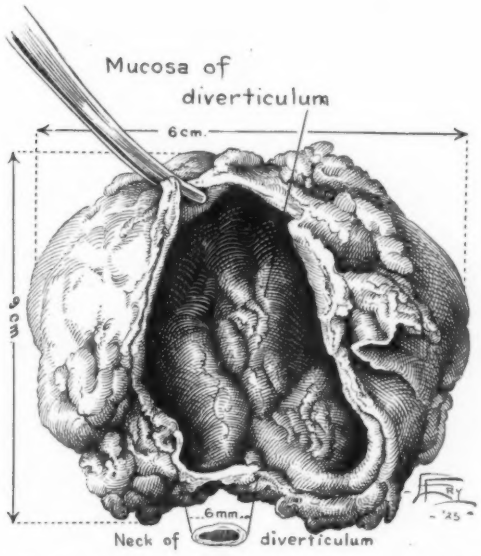

Fig. 2. Diverticulum of 200 cubic centimeter capacity, with a small outlet into the bladder.

The most common cause, generally occurring in old men and causing distention and dilatation of the diverticular sac, is obstruction of the neck of the bladder, due, in most cases, to an enlarged prostate, or to contraction of the neck of the bladder.

INCIDENCE

Large vesical diverticula sometimes do not cause trouble. They are found at necropsy in old men who have died of other diseases, and who have had little or no bladder trouble during life. Apparently as long as the wall of the diverticulum is capable of contracting regularly and emptying its contents, and is not infected, it is a harmless condition. Obstruction of the bladder, retention of urine, infection, and the not uncommon sequelæ, formation of stone or malignant degeneration, make of this abnormality a serious, and sometimes a rapidly fatal, disease. Harrison reported a case of a man, aged 103 years, who died suddenly from acute pericystitis which set in following infection of an apparently quiescent vesical diverticulum.

The conditions predisposing to the recognition of vesical diverticulum, obstruction, and infection, are much more common in men than in women. True diverticula are exceedingly rare in women; they may be the result of anomalous formations of the bladder, or cystic condition of the urachus, or they may be secondary to operative procedures affecting the bladder. In earlier case reports, protrusions of the bladder through weakened perineal muscles were often grouped and reported as diverticula of the bladder.

Diverticula vary in capacity from about 1 cubic centimeter to several liters (Fig. 2). Braasch does not consider the small cellules, sometimes seen with trabeculation of the bladder, as diverticula. Diverticula as large, or larger than the normal bladder are not uncommon. Israel records the case of a man, aged 66 years, with a diverticulum three times the size of his bladder. Targett cites Green's case, which held a gallon of urine. Pothérat reported a sac holding 5.5 liters. The small diverticula are generally rounded or oval, and lie between the bladder and the rectum, extend-

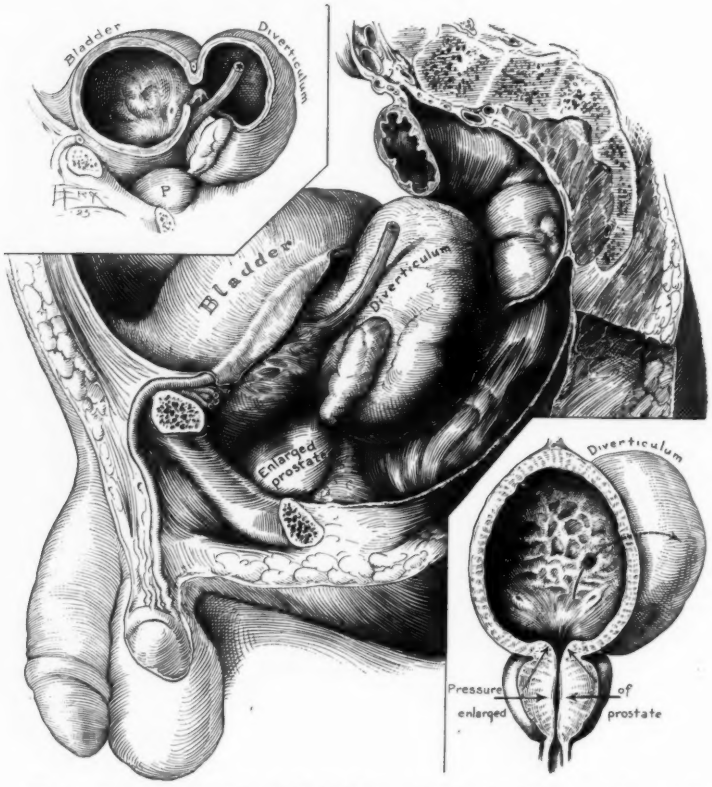

Fig. 3. Large diverticulum of the bladder extending upward between the rectum and bladder. Inserts show location of outlet of sac into the bladder.

ing laterally and upward on increasing in size (Fig. 3). In young men, before serious obstruction has set in, the sac is often thick walled, containing all the layers of the normal bladder. Long standing, mild obstruction and infection cause distention and dilatation of the sac, the wall becomes stretched and thinned, and muscular tissue atrophies or disappears. The bladder itself is generally hypertrophied and thick walled. Rehfisch believes that this hypertrophy of the wall of the bladder results from continued action of the vesical musculature: the bladder is always manipulating urine; it is never completely relaxed. After it is partially emptied the pressure falls, and the urine runs from the diverticulum to the bladder, increasing the work of delivery.

REVIEW OF CASES

From the year 1894 to 1923, 133 cases of diverticulum of the bladder have been treated surgically at the Mayo Clinic. One hundred thirty-one of the patients were men and two were women. Complete postoperative data were obtained on 110 (83.9 per cent) cases. Ninety of the patients (67.6 per cent of 133) had single diverticula, forty-three (32.3 per cent of 133) had multiple diverticula, seventeen had two, ten had three, six had four, and in ten the number was not determined.

AGE OF PATIENTS

Diverticula may be found during any period of life, but they are most common in old men of prostatic age (Table 1). Cases in which this condition has been found in the fetus are

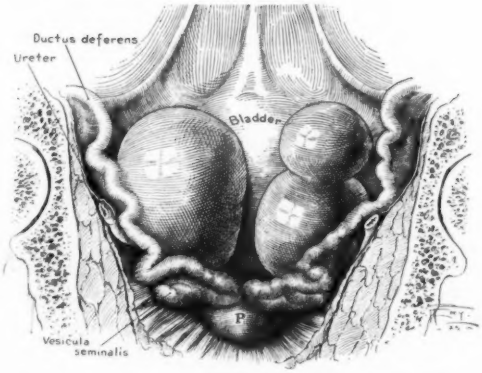

Fig. 4. Posterior view of large bilateral diverticula.

reported by Durrieux, Fischer, and others. In most cases in which symptoms are present before puberty they appear shortly after birth. Clark reported the case of a child, aged 5½ years, with a vesical diverticulum who had had urinary difficulty for 4 years. Rorig reported a similar case in a child, aged 2½ years, with urinary symptoms since birth. Englisch noted the case of an infant of 8 days, with a vesical diverticulum containing a stone. Fronz reported a case of a girl, aged 12 years, with symptoms of appendicitis. A large cystic right abdominal tumor was found, and on exploration a vesical diverticulum was removed. Hyman reported three cases of excision of diverticula in young children. One patient was only 9 months old; two large diverticula were resected with a good ultimate result. On one side the ureter was involved in the diverticulum.

LOCATION

The orifices of either the single or multiple diverticula are usually in the region of the ureteral orifices. Of 163 cases collected by Hinman in which the location of the outlet was noted, 123 (75.4 per cent) were near the ureteral orifices. The opening is sometimes found on the lateral wall or in the fundus. It is only rarely that the trigone is involved, though occasionally an opening is found just above the interureteric ridge. Liston reported a case of a large diverticulum, the mouth of which involved the whole extent of the tri-

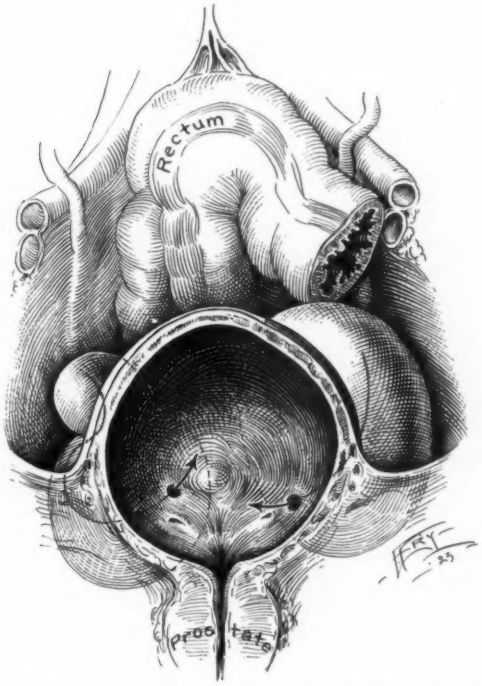

Fig. 5. Anterior view of diverticula, showing location of bilateral outlet into the urinary bladder. Bilocular diverticulum on right; compartments communicating by means of a small orifice.

gone. The unusual position of the outlet was explained by the fact that the cause of the urinary obstruction was in action at the end of fetal life, and, therefore, its greatest effect was produced on the trigone, or the portion of the bladder which is the last to be developed.

Diverticula which open in the dome are generally small and often multiple. True single, large diverticula occurring in the dome,

TABLE I.—INCIDENCE OF OCCURRENCE OF DIVERTICULA BY DECADES

Years	Patients
10 to 20	1
21 to 30	4
31 to 40	9
41 to 50	14
51 to 60	44*
61 to 70	48*
71 to 80	13
Total	133

*69.2 per cent between 50 and 70.

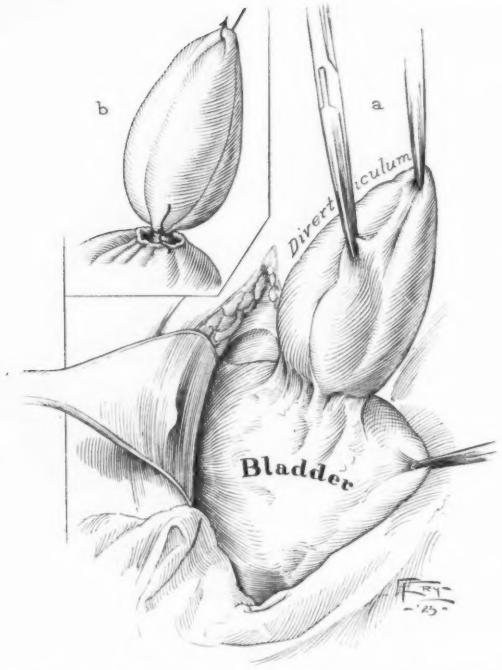

Fig. 6. Dissection of diverticulum from surrounding tissue with ligature of the neck of the sac.

are rare, and are sometimes confused with cystic conditions of the urachus. The single diverticula were located in the right wall, ureteral area, in 33 cases; in the right wall, high lateral area, in 3; in the left wall, ureteral area, in 32; in the base, between the ureteric orifices and above the interureteric ridges in 14, and in the fundus and dome in 8.

The location in 23 of the 43 cases of multiple diverticula is known: in 15 instances one outlet was located in the ureteral area; in 5, the openings were in the base of the bladder; in 2, on the lateral wall, and in 1, the multiple orifices were in the dome (Figs. 4 and 5).

OPERATIVE PROCEDURES (133 CASES)

Excision of diverticula. In 50 cases (37.59 per cent) excision alone was done; 3 patients died, giving an operative mortality of 6 per cent (Table II). The diverticula were mostly large, and no other lesion was present. In 37 cases the diverticula were single, and in 13 multiple. In 47 cases the diverticula were excised extravesically (Table III). The bladder was opened suprapubically, one or two fingers were placed in the orifice of the diverticulum and used to exert traction on the sac which was then dissected out. The sac was

TABLE II. — LOCATION OF DIVERTICULA IN FIFTY CASES IN WHICH EXCISION ALONE WAS DONE

	Cases
Single diverticula	
Right wall, ureteral area	16
Right wall, high lateral	2
Left wall, ureteral area	12
Base	5
Fundus	2
Total	37
Multiple diverticula	
Two diverticula, one in each ureteral area	4
Two diverticula, one in right wall and one in midline	1
Two diverticula, one in right wall and one in fundus	1
Four diverticula, one in left wall and three in left ureteral area	1
Two diverticula, in right ureteral area	2
Two diverticula, in left ureteral area	3
Four diverticula, in dome	1
Total	13

TABLE III.—POSTOPERATIVE DATA IN THIRTY-SIX OF THE FORTY-SEVEN CASES IN WHICH THE DIVERTICULUM WAS REMOVED EXTRAVESICALLY

Patients living.....(72.6 per cent of 36) 26

	Without bladder symptons	Cystitis	Complete retention	Complete incontinence
1 year after operation	6	..	..	..
2 years after operation	4	2	1	..
3 years after operation	4	1	..	..
4 years after operation	1	..	..	
5 years after operation	4	..	..	1*
6 years after operation	1	..	..	..
10 years after operation	1	..	..	..
Total	21	3	1	1

Patients dead.....(27.8 per cent of 36) 10

First month after operation	3
Second to twelfth month after operation (Three of these died of carcinoma of the bladder)	4
First to second year after operation (Two of these died of carcinoma of the bladder)	3

* Present before operation

TABLE IV.—POSTOPERATIVE DATA ON THREE CASES IN WHICH THE DIVERTICULUM WAS REMOVED TRANSVESICALLY

	Cases
Alive 1 year after operation without symptoms	1
Alive 2 years after operation without symptoms	1
Alive 3 years after operation without symptoms	1

TABLE V.—POSTOPERATIVE DATA ON TWENTY-THREE OF THE THIRTY-ONE CASES IN WHICH PROSTATECTOMY AND EXTRAVESICAL REMOVAL OF THE DIVERTICULA WERE DONE

Patients living.....(65.1 per cent of 23)		15
	Complete recovery	Bladder trouble
1 year after operation	2	1
2 years after operation	1	1
3 years after operation	2	1
4 years after operation	2	..
5 years after operation	3	..
6 years after operation	1	..
9 years after operation	1	..
Total	12	3
Patients dead.....(34.9 per cent of 23)		8
First month after operation		3
Second to twelfth month after operation		3
Two years after operation		1
Three years after operation (carcinoma of bladder)		1

TABLE VI.—POSTOPERATIVE DATA ON THREE OF SIX CASES IN WHICH PROSTATECTOMY AND TRANSVESICAL REMOVAL OF THE DIVERTICULUM WERE DONE

	Cases
Alive 1 year after operation	1
Alive 2 years after operation (1 has severe cystitis)	2

TABLE VII.—LOCATION OF DIVERTICULA IN THIRTY-SEVEN CASES IN WHICH EXCISION AND PROSTATECTOMY WERE PERFORMED

	Cases
Single diverticula	
Right wall, ureteral area	12
Left wall, ureteral area	7
Right wall, high lateral	1
Base	4
Fundus	3
Total	27
Multiple diverticula	
Two diverticula in one ureteral area	3
Two diverticula, one in each ureteral area	2
Two or more diverticula in base	5
Total	10

cut off at the neck and the bladder closed with two rows of suture (Figs. 6 and 7). In 3 cases the diverticula were removed transvesically by the method described by Young in 1906 (Table IV). This method is applicable only to the smaller diverticula, and to those not markedly adherent to the surrounding structures. A pair of forceps was passed through the orifice of the diverticulum, and the base of the sac was grasped and drawn upward and inverted into the bladder. The sac was then cut off at the neck, and the orifice closed (Fig. 8).

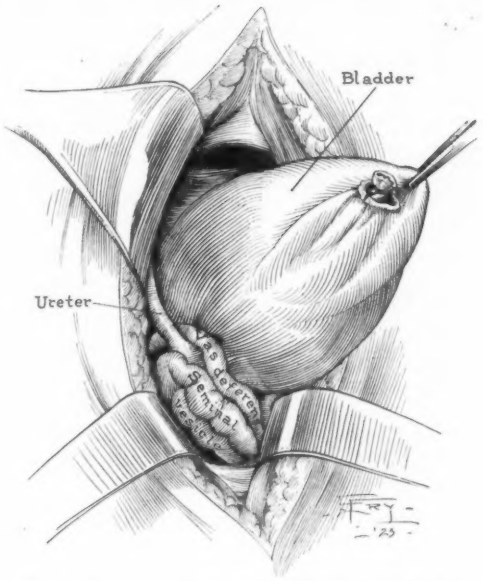

Fig. 7. Loose atonic bladder raised from the incision, exposing structures surrounding diverticulum after its removal.

Excision of diverticulum and prostatectomy. In 37 cases (27.81 per cent) excision of the diverticulum and prostatectomy were done; 3 patients died, giving an operative mortality of 8.1 per cent. In 31 of these cases, the diverticulum was excised extravesically; in 6 it was removed transvesically (Tables V, VI, and VII).

Palliative operation. In 44 cases (34.58 per cent) the diverticulum was not removed. Prostatectomy and dilatation of the outlet of the diverticulum were done in 23 cases. In 11 cases, the outlet was dilated, and stones removed. In 10 cases, the bladder was drained, and the outlet of the diverticulum dilated (Tables VIII, IX, and X). There was one case in which the diverticulum was obliterated transperitoneally, and one case in which the lining of the diverticular sac was curetted, both with good immediate postoperative results. No later data were obtainable.

DISCUSSION

No single definite method of treatment can be followed in all cases. If there is definite obstruction at the neck of the bladder, this

TABLE VIII. — POSTOPERATIVE DATA ON TWENTY-TWO OF TWENTY-THREE CASES IN WHICH PROSTATECTOMY AND DILATATION OF THE OUTLET OF THE DIVERTICULUM WERE DONE

	Cases
Patients living.....(68.2 per cent of 22)	15
No further symptoms 2 to 6 years after operation..	6
No further symptoms 1 year after operation.....	2
Persistence of bladder trouble 1 to 2 years after operation.....	7
Patients dead.....(31.8 per cent of 22)	7
First month after operation.....	4
2 were associated with enormous diverticulum	
1 had multiple diverticula	
1 had carcinoma of the prostate	
One year after operation.....	1
Two years after operation (carcinoma of bladder)..	1
Five years after operation.....	1

TABLE IX.—POSTOPERATIVE DATA ON FIVE OF THE ELEVEN CASES IN WHICH THE OUTLET WAS DILATED AND STONES REMOVED

	Cases
Patients living.....	4
No symptoms of bladder trouble 5 years after operation.....	2
No symptoms of bladder trouble 1 year after operation.....	1
Symptoms of diverticulum persisting one year after operation.....	1
Died 1 year after operation.....	1

TABLE X.—POSTOPERATIVE DATA ON EIGHT OF THE TEN CASES IN WHICH THE BLADDER WAS DRAINED, AND THE OUTLET OF THE DIVERTICULUM DILATED

	Cases
Patients living.....	4
No symptoms of bladder trouble for 4 years.....	1
Draining from suprapubic opening for 3 years.....	1
Draining from suprapubic opening for 1 year.....	2
Patients dead.....	4
Died first month after operation	3
1 of carcinoma of the bladder	
1 of carcinoma of the prostate	
1 apparently from spinal anæsthesia	
Died 1 year after operation.....	1

and the diverticula must be attended to before the bladder will function normally. Case 1 illustrates the various methods of excision that may be adapted to suit the case.

CASE 1. (A226631.) A man, age 29, came to the Clinic on account of frequency of 2 months' duration. At operation three diverticula were found; a large sac opening in the left ureteral area was excised extravesically; a small sac of about 30 cubic centimeters capacity, lying above the left meatus was inverted into the bladder and removed intravesically, and a small diverticulum of several cubic centimeters was merely stitched over. The patient made a good operative recovery.

In cases of diverticula in young men, and in patients without urinary infection, good results are generally obtained after removal. The diverticula are only rarely attached to surrounding structures and generally dissect out easily. In this series were 11 cases without urinary infection. One patient died of bilateral hydronephrosis 8 days after operation. Complete postoperative data were obtained concerning 8 of the remaining 10. One died 2 years after operation. The remaining 7 are living and well from 1 to 10 years after operation.

Drainage of diverticula. In certain cases, especially large infected diverticula, excision exposes a wide area to infection. Drainage of the bladder and diverticulum as carried out by Hunt, will reduce the infection and cause the diverticulum to shrink markedly, permitting a safer secondary resection later.

CASE 2. (A370098.) A diverticulum, the size of a normal bladder, was found opening near the left ureteral orifice. There was marked infection and the wall of the bladder was thick and hypertrophied. The bladder was drained. One month later a cystogram injected through the suprapubic sinus revealed that the diverticulum had shrunk to about 4 centimeters in diameter. Two months after the first operation the infection had decreased, and the diverticulum, which was comparatively small, was readily dissected out and excised extravesically.

CASE 3. (A289362.) A diverticulum, of 250 cubic centimeters' capacity, was found opening in the posterior wall of the bladder. The patient was not in condition for an extensive operation, therefore the bladder was drained only. Two months later the sac had shrunk to about 30 cubic centimeters and was excised intravesically; prostatectomy was also performed. There was very little bleeding at this operation. One year later the patient was living and well.

Involvement of the ureter. Not infrequently the ureter opens directly into the diverticulum, or it may be incorporated in the wall of the sac, or matted in adhesions, so that it must be cut in order to remove the diverticulum. Hinman, in 12 of 205 collected cases, found the ureter involved. Marion described a specimen from the Musée Civiale in which both ureteral orifices were contained in a diverticulum. As brought out in an earlier

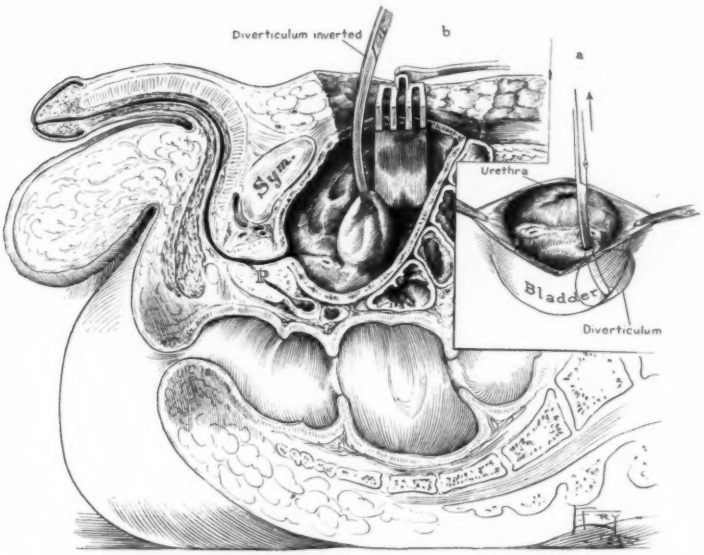

Fig. 8. Transvesical removal of diverticulum. Insert shows method of grasping inner wall of diverticulum preparatory to inverting it into the bladder.

paper (20), in cases in which the ureteral opening is found to be marginal, the adjoining mucous membrane should be turned into the closure of the bladder. Hydro-ureter and destruction of the kidney are often produced by pressure from the diverticulum on the lower ureter, at times causing almost complete obstruction. Paschkis reported a case of this type. The diverticulum in such cases is generally small, sometimes bilateral, and its neck crosses the ureter at the ureterovesical angle. In removing a diverticulum in which the ureter is involved, the condition of the ureter should determine the advisability of transplanting it to a different part of the bladder. In an occasional case, especially in young men in whom there is only moderate infection, it is advisable to attempt to conserve the involved kidney and transplant the ureter to a different portion of the bladder.

CASE 4. (A215976.) A man, age 32, had complained of bladder discomfort for 2 years. At operation a diverticulum, almost as large as the bladder, was found. The left ureter, which opened directly into the sac, was normal in appearance; it was transplanted into the bladder. A small catheter was then inserted into the reimplanted ureter and the diverticulum excised. Six years later, the patient was living and well, although occasionally there was evidence of urinary infection.

In four cases in which the ureter opened directly into the bladder it was merely ligated, cut, and allowed to drop back into the wound. This is a satisfactory procedure if the opposite kidney functions normally, and if the ligated side is not markedly infected. In two cases there was no further difficulty; the third (Case 5) illustrates the need for determining the functional capacity of the opposite kidney, and the fourth (Case 6), the result of ligation when the corresponding kidney is infected.

CASE 5. (A323270.) A man, age 60, had had complete retention for 2 months, requiring constant catheterization. At operation the bladder was large, thick-walled, and badly infected. A diverticulum holding from 800 to 1000 cubic centimeters opened in the left base and involved the ureteral orifice. This was excised extravesically, and the ureter ligated. The patient did not recover well from the operation; urination was scanty, and he died of uræmia on the fifteenth day.

CASE 6. (A321653.) A man, age 66, had had difficulty in, and frequency of, micturition and pain in the bladder for 4 years. He had 1500 cubic

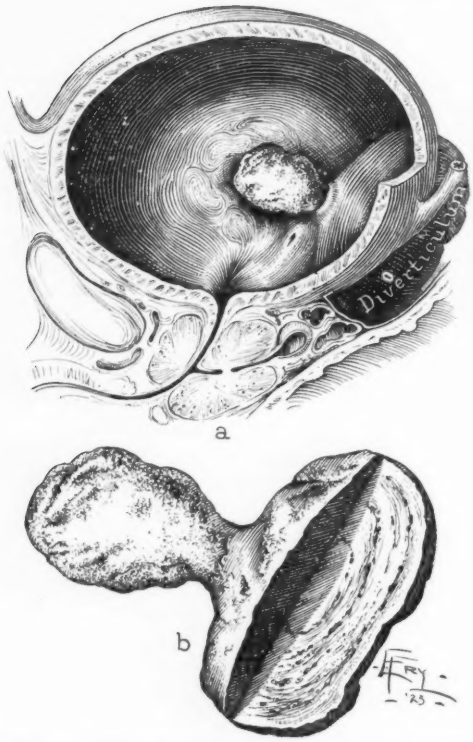

Fig. 9. Dumb-bell type of stone with the larger portion in the diverticulum.

centimeters of residual urine. A diverticulum three times the size of a normal bladder was found at operation. This was drained and 2 months later excised extravesically. The right ureter, which opened into the diverticulum, was large, dilated and infected; it was ligated and cut. The patient passed very little urine following the operation; temperature and pulse became markedly elevated, and there was evidence of a right renal infection. After drainage of the right renal pelvis, symptoms subsided, and sufficient urine passed to bring him through the critical period.

Stone and diverticulum. Apparently, urinary obstruction and the sacculation of infected urine are conducive to the formation of calculi. Cassanetto reported a case of a man, aged 72 years, with a stone 10 centimeters in diameter impacted in a diverticulum at the base of the bladder. Fenwick reported a case in which there was a large hour-glass stone, the larger half of which was in the diverticulum. In order to remove the portion in the diverticulum, it was necessary to fracture it with a mallet and chisel. Kummer reported a case in which the stone in the diverticulum weighed 350 grams. Generally when large stones are found in the diverticulum there are also stones in the bladder. Englisch was able to collect from the literature 171 cases of stone in a diverticulum; twenty-one of the patients were under 10 years. Seventy-nine had a single stone. Operation was performed on 124 patients, with 44 deaths. In most cases the operation consisted of merely removing the stone. In 13 children under 10 years, with vesical diverticulum, Durrieux found 8 to have stones in the diverticulum. Dumb-bell and hour-glass shapes are not uncommon types; generally the larger portion of the stone is in the diverticulum (Fig. 9). Cases of this type are reported by Cassanetto, Fenwick, Kelly, Martin, and Crenshaw and Crompton.

In a review of the cases of vesical calculi and diverticula treated at the Mayo Clinic, both with cutting and endovesical procedures, Crenshaw and Crompton found 28 (12.1 per cent of 609 cases of vesical calculi) in which these two conditions were associated. There were 13 cases in which the stone was in the bladder alone, 9 with stone in the bladder and diverticula, and 6 with stone in the diverticulum alone. The statistics of Crenshaw and Crompton indicate that stagnation and infection of urine are factors in the formation of these stones. In the 28 cases of stones and diverticula, 3 patients had passed many stones before coming to the Clinic, 6 had had stones removed at previous operation, one having had two operations. In the cases in which the diverticulum was not removed at the first operation in the Clinic, there were seven recurrences of stone in 4 patients, 5 in the bladder and 2 in the diverticulum. The total number of recurrent stones was 17 in 13 patients. In cases in which the diverticulum was removed, there were no recurrences of stone.

In 20 cases of the series of 133 cases, diverticula were associated with calculi. Stone was found in the diverticulum in 9 cases. In 6 of these it was removed and the diverticulum

excised. There were no deaths. Recent reports from 5 patients show that 3 are alive with symptoms of bladder trouble 2 years after operation; one patient complains of cystitis 2 years after operation, and one is alive 5 years after operation, without symptoms. In 3 cases the stone was removed, and the bladder drained; the diverticulum was not removed. In one case in which a recurrent stone was removed, the patient is alive 5 years after operation, without symptoms. One died 1 month after operation of pulmonary embolism; one was not heard from. In 8 cases of stone in the bladder only, one patient, with excision of diverticulum and removal of stones, is well 1 year after operation; one patient, with removal of stones only, is well 5 years after operation; one patient, 1 year after removal of stones only, still has cystitis, and one patient 6 years after removal of stones only, has cystitis. One patient with removal of stones, excision of diverticulum, and excision of epithelioma of the bladder, died 3 years after operation. One patient, with removal of stones only, died 2 weeks after operation. Two patients have not been heard from. In three cases with stone in the bladder and diverticulum, one patient, with removal of stones and excision of diverticulum, died 1 year after operation; one patient, with removal of stones, died of epithelioma of the bladder 1 year after operation, and one patient was not heard from.

Carcinoma and diverticulum. Malignant tumors are not uncommonly found in association with diverticulum. The infection and inflammation, and the occasional irritation from calculi are apparently conducive to the formation of new-growths, as the incidence of association of diverticulum and carcinoma is very high. Targett described three cases from London museums; in one the diverticulum contained a large sarcoma, one a papillomatous tumor, and one an epithelioma which grew into the diverticulum from the wall of the bladder. Young reported a case in which a carcinoma was found protruding from a pen-point diverticular orifice. The diverticulum and growth were resected with a good result. Other cases in which a diverticulum contained a malignant tumor are reported by Buerger, Perthes, and Englisch. Hofmokl reports a case of a very large single diverticulum which was filled with polypi. In our series of 133 cases, carcinoma was found in 10.

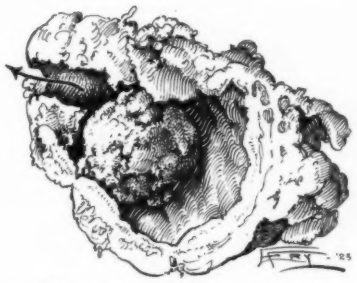

Fig. 10. Diverticulum containing a small malignant papilloma.

CARCINOMA OCCURRING IN THE DIVERTICULUM —FOUR CASES

CASE 7. (A153277.) A man, age 62, had had hæmaturia and dysuria for 2 years. At cystoscopic examination a diverticulum was found. The orifice was 1 centimeter above the right ureteral outlet, and a small papillomatous mass was seen protruding from the diverticulum. At operation the diverticulum was excised extravesically, and the patient convalesced uneventfully. Five months later he returned with an inoperable tumor in the suprapubic area; he died 1 year after operation (Fig. 10).

CASE 8. (A214566.) A man, age 62, had complained for 2 years of difficulty in urination and periodic attacks of hæmaturia. Cystoscopic examination revealed an epithelioma, 4 centimeters in diameter, surrounding and growing into a diverticular orifice in the left ureteral area. At operation one-fourth of the bladder was removed, together with the diverticulum and lower left ureter. A partial prostatectomy was performed, and the ureter reimplanted into the bladder. The diverticulum had a capacity of about 150 cubic centimeters. The patient died 6 months later, probably from a recurrence.

CASE 9. (A273376.) A man, age 65, had had hæmaturia for 3 years. Cystoscopic examination revealed a diverticulum of the left upper wall with an epithelioma protruding through the orifice. At operation a diverticulum of about 100 cubic centimeters' capacity was found. At the margin of the growth and extending into the neck of the diverticulum was an indurated, flat, malignant growth. The entire surrounding mucosa and diverticulum were removed in one piece. The patient improved following the operation; but shortly afterward, again complained of difficulty in micturition. He died 2 years after operation (Fig. 11).

CASE 10. (A345164.) A man, age 57, came to the Clinic on account of intermittent hæmaturia of 10

months' duration. Cystoscopic examination revealed a diverticulum of the right wall and base with a papillomatous tumor protruding from the orifice. At operation the growth was found to be very extensive and fixed, and to involve the overlying peritoneum. The glands along the right internal iliac artery were involved. Four 12.5 milligram radium needles were inserted into the growth extravesically, remaining in place for 12 hours. The patient died on the twenty-fifth day after operation.

DIVERTICULUM AND CARCINOMA OF THE BLADDER—SIX CASES

CASE 11. (A68773.) A man, age 63, complained of nocturia and frequency of 5 years' duration. Recently he had passed gravel. At operation a diverticular sac filled with stones and opening on the right wall, and an extensive epithelioma of the base of the bladder were found. The diverticulum and epithelioma were resected, and the prostate, which was also involved, was removed. The patient died 3 years after the operation.

CASE 12. (A219993.) A man, age 53, came to the Clinic on account of a large amount of residual urine in the bladder, requiring frequent catheterization. Operation revealed an inoperable epithelioma of the bladder, and a large diverticulum opening into the side of bladder. Patient died 3 months later.

CASE 13. (A222405.) A man, age 57, had been catheterizing himself daily for 6 months on account of residual urine. At operation the bladder was drained. A large diverticulum of the left wall was seen. Three months later the patient died, and at necropsy a papillary carcinoma of the base of the bladder, and a large diverticulum of the left wall containing three large stones were found. There was also a suppurative ureteropyelonephritis, and a left perivesical abscess.

CASE 14. (A340391.) A man, age 61, had had frequency and dysuria for 2 years. Operation revealed three diverticula of the base of the bladder with an epithelioma extending over the mucosa of the prostate. The growth was enucleated; the diverticula were not disturbed. The patient died 2 days after the operation. Necropsy revealed marked bilateral hydronephrosis.

CASE 15. (A348703.) A woman, age 63, had been troubled with frequency for 1 year. Operation revealed an area of ulceration, and a shallow divertculum in the right base of the bladder; the area of ulceration and the diverticulum were completely excised. One year later, after a return of symptoms, exploration of the bladder revealed an extensive inoperable carcinoma of the base. The patient was given 1400 milligram hours of radium in two doses. Eight months later she was again having symptoms.

CASE 16. (A362923.) A man, age 60, came to the Clinic on account of frequency and dysuria of 18 months' duration. At operation, four diverticula of the bladder were found. There were three small diverticula on the right, and one large diverticulum on the left, containing a stone. All the diverticula were removed transvesically. There was marked inflammation of the bladder which also contained three stones, each about 3 centimeters in diameter. No definite evidence of epithelioma of the bladder was found. The patient convalesced normally, but symptoms returned in a short time, and 16 months later he died of epithelioma of the bladder.

Mortality. Englisch, in 1894, found that in 83.1 per cent of the reported cases of vesical diverticula the patients had died as a result of the condition. At this time very few operations were performed on the bladder, and in most cases the diverticula were probably seen only in the late stages. In 1910, Fischer collected 48 cases in which, with and without operation, 32 patients (66.7 per cent) died. Of 28 patients subjected to operation, 8 (40 per cent) died. In 1922, Kneise and Schulze collected 35 cases from the German literature and added 18 of their own, in which radical operations were performed. Four patients (7. 7 per cent of 52) died following operation.

The patients dying following operation for vesical diverticulum do not die from any constant cause. Practically all in whom the diverticula are of moderate or large size and are infected, have chronic nephritis, and sometimes terminal acute nephritis.

DEATHS FOLLOWING EXCISION OF THE DIVERTICULUM

CASE 17. A man, age 60, had a large diverticulum into which the ureter opened. The diverticulum was excised extravesically, and the ureter tied and dropped back. The patient died on the fifteenth day. Necropsy revealed acute bilateral pneumonia, and bilateral pyelonephritis.

CASE 18. A man, age 64, had a very large, thick-walled, adherent diverticulum; it was necessary to remove it in pieces, extravesically. There was much soiling of the surrounding tissues. The patient died on the twenty-seventh day from chronic interstitial nephritis and subacute pyelonephritis.

CASE 19. A man, age 53, had a diverticulum as large as the bladder, very adherent and difficult to dissect out. It was removed extravesically. The patient died on the twenty-seventh day of right pulmonary embolism, suppurative cystitis, and chronic diffuse nephritis.

CASE 20. A man, age 67, had a huge diverticulum which opened near the right meatus, and with a capacity greater than the bladder. It was removed extravesically. Death occurred on the eighth day from uræmia. Necropsy revealed bilateral hydronephrosis, gangrenous cystitis, and right pyelone-

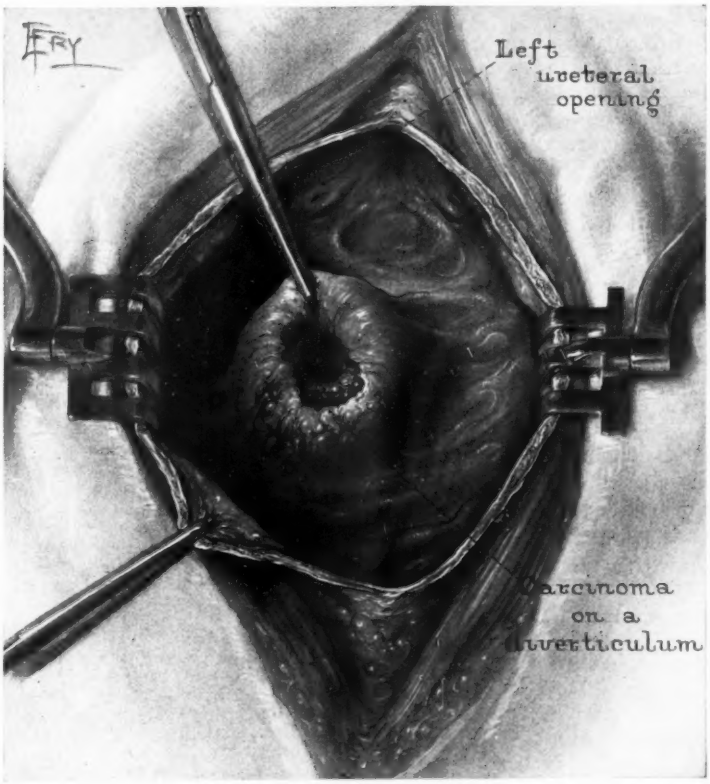

Fig. 11. Carcinoma growing on border of diverticular outlet and extending down into sac.

phritis. The peritoneal cavity had been explored at the time of operation, and then closed. No evidence of peritonitis was found at necropsy.

CASE 21. A man, age 65, had a large, thick-walled diverticulum, adherent to the surrounding structures, and infected. It was excised extravesically. Following operation there was complete urinary suppression. Decortication of the kidneys was performed, and the right renal pelvis drained. The patient died 2 days later, and necropsy revealed chronic nephritis, bronchopneumonia, and acute cysto-uretero-pyelitis.

CASE 22. A man, age 66, had a very large diverticulum, opening into the base of the bladder, and also severe cystitis. Death occurred 2 days after excision of the diverticulum. Necropsy revealed acute and chronic nephritis, mechanical constriction and dilatation of the left ureter 1 centimeter from the bladder, and chronic valvular endocarditis.

In the cases in which death occurred following palliative operations for the diverticulum, the patients were critically ill, and in most cases only an emergency drainage of the bladder could be made. In all cases a marked infection of the bladder was present together with extensive destruction of the kidney. Two of the patients who died following a palliative operation also had carcinoma of the bladder, and one, carcinoma of the prostate.

SUMMARY

One hundred thirty-three cases of diverticulum of the bladder were studied with regard to the type of operation performed and the postoperative results. One hundred thirty-one of the patients were men, and two were women. Complete postoperative data were obtainable in 110 (83.9 per cent) cases. In 32 per cent the bladder contained multiple diverticula. Diverticula occur most com-

monly at the prostatic age; 69.2 per cent of the patients were between 50 and 70 years of age. The most common location of the orifice is in the region of the ureteral outlet; 87 per cent of 90 single diverticula were found in this location.

The diverticula were completely excised in 50 cases. Three patients (6 per cent) died. In 37 cases in which there was obstruction of the vesical outlet, the diverticulum was excised, and prostatectomy performed. Three patients died (8.1 per cent). In 46 cases the diverticulum was not removed.

The ureter was involved in the diverticulum in 5 cases; in 1 it was transplanted to a healthy portion of the bladder. In 4 cases in which the ureter was dilated, it was ligated, cut, and allowed to drop back into the wound.

In 20 cases the diverticula were associated with stones. In 9 cases the calculi were in the diverticulum, in eight in the bladder, and in 3, both in the bladder and in the diverticulum.

Carcinoma occurred in the diverticulum in 4 cases. Three of these patients died shortly after operation, and the fourth died 2 years after resection of the diverticulum. In 6 cases carcinoma of the bladder and diverticula were found. Three of these patients died shortly after operation; one lived 16 months, and one 3 years. The sixth had a recurrence 8 months after excision of the involved area.

Of the 6 patients who died following excision of the diverticula, five died as a result of renal infection and obstruction; in most instances they had both acute and chronic nephritis. The sixth patient died of pulmonary embolism; this patient also had chronic nephritis.

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THE INFLUENCE OF TRAVEL, READING, WRITING, AND SPEECH-MAKING ON THE PROGRESS OF SURGERY[1]

By SIR WILLIAM I. DeCOURCY WHEELER, Dublin, Ireland
President, Royal College of Surgeons of Ireland

I TAKE this opportunity of expressing my deep thanks and sincere feelings of appreciation for the great honor you have done me in electing me an Honorary Fellow of your College. I prize the diploma beyond words, and my feelings cannot be adequately expressed. I offer you my humble thanks for the invitation from the Clinical Congress of the American College of Surgeons to attend these meetings, and for the high compliment of being asked to deliver the Fellowship address on the occasion of the tenth anniversary of the foundation of the College. I wish on behalf of my fellow visitors to acknowledge, with no feigned gratitude, the spirit of brotherhood which has surrounded us on all sides.

Your distinguished past president, Dr. John B. Deaver, justly pointed out that the American College of Surgeons, though national in name, is international in scope, and that the College is carrying on the basic principles of the profession for the good of humanity. The activities of the American College in the direction of hospital standardization and public health are watched and followed by many far-off admirers, Ireland perhaps not least among them. We who are visitors from afar yet feel at home at this great Congress, for the American College has demonstrated to the world the fundamental truth that medicine and surgery, and, for that matter, scholarship generally, are without nationality and know no distinction of race or of speech.

When I received, by cable, the invitation of the Regents of the American College of Surgeons to deliver this Fellowship address, I was within 2 days of leaving Dublin. As it was, I felt ill at ease with the realization that my surgical papers for the meetings at Chicago and Iowa were hurried and far from completion, and that I would be standing for judgment before an assembly which, in mere numbers, would transcend anything to which I was accustomed, and which, in intellect and understanding, would be composed of supermen in the world of medicine and surgery.

On occasions when I feel my heart sinking I go to my wife for aid. I received the encouragement which I expected. "Take the plunge," she says, "the Regents of the American College have taken a greater plunge in selecting you." My courage was restored and, in this connection, may I quote to you a favorite passage from the opening words of an address by Sir James Barrie, the creator of Peter Pan:

> "You have had many Rectors here in St. Andrew's who will continue to bloom long after the lowly ones such as I am are dead, rotten and forgotten. They are the roses in December. You remember someone said that God gave us memory so that we might have roses in December. But I do not envy the great ones. In my experience, and you may find in the end it is yours also, the people I have cared for most, and who have seemed most worth caring for—my December roses—have been very simple folk. Yet I wish that for this hour I could swell into someone of importance, so as to do you credit."

Irishmen have been, all through history, drawn toward America as if by some magnetic influence. I venture to say that the literature and the surgical work of America is as well known in Ireland as in America itself. To the pioneers and great contemporary workers in American surgery there is conceded a form of hero-worship in the Irish schools, and, as you know, it is the proud privilege of the Irish College of Surgeons, over which I for the moment preside, to possess as Honorary Fellows no less than 9 among the great surgeons of America today. It was an unheard of thing, during the 140 years of its existence for the Irish College to confer nine Honorary Fellowships on surgeons from the same land in one swoop. Only the names of those who are in the very forefront of the profession, great leaders of science, are suggested

[1] Fellowship address delivered at the Convocation of the American College of Surgeons, October 26, 1923.

to the College; only those who are masterpieces in the picture gallery of science are ever elected. We have charters, by-laws, and ordinances which are as frowning battlements guarding our diploma, the governing body is composed of individuals who are human enough to hold strong opinions of their own, and unanimity is difficult to expect and difficult to obtain. But when it came to the time to enroll the names of your retiring president, Dr. Cushing, followed by the names of Drs. William and Charles Mayo, Dr. Ochsner, Dr. Keen, Dr. Harte, Dr. Finney, Dr. Brewer, and Dr. Crile, there was not a dissentient voice, and it is a phenomenal thing to have a meeting in Ireland with no dissention. Our predecessors, who surrounded the Fellowship with barbed wire entanglements and fortified the approaches realized that from time to time such figures as I have mentioned would stand out as beacons in the great medical community, and an opening was provided through which they could pass and be received with open arms.

It is natural that we in the surgical profession in Ireland give pride of place to American surgeons deep down in our hearts. Many of the greatest of them bear Irish names; blood is thicker than water and furthermore the donors and the recipients in the transfusion of the two races belong to the same group. "May the members of the medical profession of the two lands be joined in brotherhood for ever in the service of mankind."

Uppermost in my thoughts at the moment is the influence of travel, of reading, of writing, and even of speech-making, on the progress of surgery; and here I turn to the great American Osler, born in Canada, adopted by the United States, embraced by England, and beloved by all. He refers to students who wish to have the best that the world offers. "Let me suggest," says he, "that the lines of intellectual progress are veering strongly to the West, and I predict that in the 20th Century the young English physicians will find their keenest inspiration in the land of the setting sun." He had, as we in Ireland have, "a love for the land where dreams come true; dreams of more secure reward for honest industry; dreams of freedom from the irksome restraints and conventions which have outlived their day; dreams of equality, not of the cap-in-hand apologetic kind, but frankly avowed and sincerely prized, equality which makes the exceptional truckling to rank by the few a subject of hearty laughter." I have quoted just now the words of my father-in-law who last year returned from America after a memorable experience as the guest of the American Bar Association. It was natural that he and I should discuss America, and that brought us to the close connection which exists between medicine and the law, and how they, in turn, are linked up from times immemorial with literature and the Church. What a combination of forces! what an irrestible army! brothers in arms defending the strongholds of science and learning; allies taking the offensive against ignorance and error. Thus the Lord Chief Justice of England speaks of a great lawyer engaged in the work of the physician and surgeon in reconciling difficulties, in healing and preventing contention, and in making the wheels of the body politic move as smoothly as possible.

But let us for a moment return to the question of travel and peep again into the thoughts of Osler. He deplores contentment with second-hand knowledge derived from books; he urges scientists to have a sense of obligation, and to contribute to the stores from which they so freely draw, and he pleads that, by familiarity with workers abroad, literature may be emancipated from crude and faulty observations. Those of us who live in a small island find it difficult to realize and to attach sufficient importance to these matters. It is very difficult, even for an Irishman, to live on an island and not to have an insular outlook, but difficulty is a severe instructor and we are learning from our difficulties as well as from our mistakes. "Just as soon as you have your second teeth," says the medical philosopher, "think of a change; get away from the nurse; cut the apron strings of your old teachers; seek new ties in a fresh environment." With a great wide outlook, he deplores intellectual infantilism and that disease which is known as "progeria" in which, as if by the touch of the wand of some malign fairy, the victim skips adolescence,

maturity, and manhood, and passes to senility, wrinkled and stunted, a little old man among his toys. The rubbing of medical minds together is all for the good. Sometimes the process produces friction, but the sparks and fireworks thus produced indicate a want of mental lubrication and a useful lesson is learned thereby.

With the limited vision which is given to one who lives and works in a small country, two other diseases induced by the want of travel and of reading and writing became apparent. Have any of you great consultants in a big land seen cases of swelled head and writer's cramp developed sometimes from never using the pen? Curiously enough one condition resembles the other; we know that writer's cramp is persistent and often cannot be cured, and we deplore the fact that swelled head is seldom fatal. "Ten years of successful work in a small place may tend to make a man touchy, dogmatic, intolerant of correction, and abominably self-centered," unless he seeks inspiration and enlightenment from his brothers abroad.

Travel, reading, and writing are as signposts pointing the direction of the straight road to scientific achievement and to legitimate success. Progress along the straight road is not easy. There are many Great-hearts and Faithfuls who could recount the impediments and obstructions which they experienced on the way and tell of the bucketfuls of reprobation thrown in their path by those who resent the invaders of tradition.

With regard to writing: I have seen men—some of them colleagues of my own in the surgical profession in Dublin—dictate without note or reference work of first importance in unsurpassed language and without previous thought. To others, like myself, writing is a grind, a difficult laborious task; and yet, there have been great men, like Swift, who must have experienced the difficulties of humble contributors, for he gives the following advice to those about to write papers:

> "Blot out, correct, insert, refine,
> Enlarge, diminish, interline;
> Be mindful, when invention fails,
> To scratch your head and bite your nails."

Books and the printing press have accomplished wonders in helping forward the surging throng in search of truth. Journal literature, and monographs are the literary rocks on which workers in medicine and surgery are content to stand. Textbooks fall by making mountains out of molehills, and persisting in the retention of unwieldy classifications and bewildering names. I have been told that students in their final academic years, by misdirected diligence in the lecture theaters and libraries, sometimes were left uncertain whether such words as anaphylaxis and prophylaxis were medical terms, or the pet names of Russian and Grecian generals.

May I tell you something in relation to medicine, literature, and travel among the ancient Irish? Much of the ancient medical history of Ireland is traditional and legendary, but the people in bygone days were not devoid of literary culture. In the *Book of Genealogies* of MacFirbis, there is mention of one Eaba, a female physician. (Medical women were not peculiar to Ireland, for we learn from Tacitus that the women followed the German army for the purpose of dressing the wounds of the soldiers upon the battlefields.) In still earlier ages women practiced medicine, for in Blackie's translation of the *Iliad* we read:

> "A leech was she, and well she knew
> All herbs on ground that grew."

It is interesting to note that the Royal College of Surgeons in Ireland was the first modern licensing corporation in Great Britain and Ireland to admit women and to appoint them to the highest office in its gift. There is no paucity of isolated references to Irish medicine in ages past. The Book of Leinster records the tragic fate of Conchobhar MacNessa, King of Ulster, who died A.D. 37, and relates that he was wounded in the head by a missile from the sling of one of his enemies and was attended by a physician named Fingen. Fingen "could know by the fume which rose from a house the number that was ill in the house and every disease which prevailed in the house." The King's head was stitched with threads of gold because the color of Conchobhar's hair was the same as gold.

The ancient laws of Ireland, the Brehon laws, codified at the request of St. Patrick, A.D. 438, refers to the remuneration and responsibility of medical men. If one person wounded another, the aggressor not only was obliged to pay a fine to the injured one, but provide him as well with maintenance and skilled medical care. What a pity the Brehon laws are not still in force.

The profession of physic passed from father to son, an Irish custom which persisted until comparatively recent times. The ancient Irish doctor was shrewd enough to travel. He found inspiration in the work of his foreign colleagues, and taught posterity an important lesson thereby. Representative Irishmen of all professions remained abroad, and were found occupying distinguished positions in the various schools of Europe.

Ancient manuscripts prove how admirably Irish physicians kept in touch with the advances of learning in Continental centers: A thirst for knowledge augmented by a keen observation of the sick under their care brought medical and surgical science to a high pitch of perfection in the Ireland of bygone days.

Toward the end of the 16th Century, progress came to a standstill. Science and art decayed: Ireland was torn by strife, and warfare appears to have been the order of the day. No shelter for learning remained, and the old worthy position held when Egyptian, Grecian, and Roman thought dominated the world, was lost to Ireland for a time. This relapse was intensified by the failure of the Irish to grasp the revolution in learning brought about by the printing press. The art of printing was neglected until nearly 100 years after its adoption by the progressives of other lands. The early printed records of the great European physicians were no longer imported by the Irish; the door was shut to the knowledge freely disseminated and eagerly grasped elsewhere. No Irish medical literature existed in print at this time, and there was little to encourage men of ability to remain for study or to practice medicine in a decadent land.

This was a distressing period for Irishmen to contemplate but soon came a reaction, and we turn over the pages of medical history to find, after 100 years, the names of Colles, Graves, Stokes, Corrigan, Butcher, Tufnell, and many others.

In recent years Irish surgeons and physicians have been engaged in a heart-breaking struggle in their efforts to advance. Lethargy, inertia, and poverty, the common legacy of the great war, are in some measure to blame, but lack of interest and enthusiasm on the part of the people and of the rulers whom they elect in the working of the medical machine, has crippled the machinery and the driving force has gone. This brings me to the antagonism which exists between the ideals of the medical profession, on the one hand, and the ideals of the politicians, on the other. The term "politicians" does not include those great statesmen to whom the very life of liberty now and in the past, owes its existence, nor does it apply to those unostentatious, whole souled individuals who give their lives to the public service. I use it in the broadest sense to include those whom the world would be better without.

After all, our outlook on life, from the time we enter the medical school until we pass on into silence, is entirely different from the view taken by politicians and their cult. Whether we are biologists or craftsmen, we try to keep on a path which takes a direction through accurate observation and logical reasoning to the goal of scientific truth. The byways of political life, on the other hand, are often paved like another road—with good intentions but lead through a jungle of words and sentences, to ambiguity and nowhere. Modern statecraft appears to be based on the belief that the world can assimilate only minimum doses of truth at a time, that a big dose is dangerous and that the public should be cured of political ills by homeopathic methods. "I always hold," said Mr. Gladstone, "that politicians are the men who, as a rule, are the most difficult to comprehend."

The American College of Surgeons has surrounded our College in Ireland with many tokens of attachment. If the "time" whistle is not about to blow, I will tell you something of our College life. When the College of Surgeons in Ireland was born, in 1783, political

upheavals were the order of the day. There was a declaration that the Irish law courts were independent of England. There was a convention of all the Volunteer Corps in Ireland to obtain Parliamentary reform. So it went on, for 140 years to the present day; but on recent events I need not touch, beyond this, that we in the College are trained to be optimists, and to assume that, until a patient is dead, our efforts at treatment will be rewarded by success. Our optimism extends to a profound belief in our own country, and that the present ship of State will be steered into peaceful and happy channels.

Few institutions in Ireland can claim a record such as ours, over 140 years. Many of them were planted with great promise, and then withered away. Leckie once said that " . . . Irish institutions often fell mildewed with corruption, sometimes torn to pieces by sectarian strife, and sometimes they have perished through the constant fluctuations and vicissitudes which have so peculiarly characterized the Government of Ireland."

If anyone should ask me how it is that this College of ours has survived in a robust condition through all the storms and passions of the past and present, I would say—because it rested content in strictly attending to its own affairs. Our attitude of old, like that of one of your great statesmen today, can be summed up in the lines:

"A wise old owl lived in an oak,
The more he saw the less he spoke;
The less he spoke the more he heard.
Why can't we all be like that bird?"

Since our College Ship was chartered by King George III on the 9th of March, 1784, the pilots have been charged with the definite duty of steering for surgical progress through the seas of culture, of learning, of literature, and of science. Storms and thunders in the surrounding atmosphere may have shaken our hopes, but the course of the ship was never deflected by a single degree. The College is possessed of peculiar powers of vision; it has been color-blind since the day it was born, and, in consequence, is unable to distinguish one political color from another, and in questions of sect it either "sees double" or prefers to become totally blind.

We have no politicians, in the mischievous sense, in the College of Surgeons in Ireland. We have no classes and cliques, such as brought forth the following lines from the late Lord Fisher:

"We are God's chosen few,
All others will be damned;
There is no place in heaven for you—
We can't have heaven crammed."

We regard politics, medicine, and surgery as an incompatible mixture which produces an explosion, and which has no place in our College pharmacopœia. Thus we in the medical profession in Ireland, while sharing risks and dangers, have been allowed to remain comrades and to live in peace.

With regard to speech-making, I have little to say. It is a forcible means of propaganda, if used fairly, in spreading the light of learning and of justice. It is a power which, in the hands of some, may be the means of far-reaching mischief and bring about irretrievable harm. I have read that "the faculties of speech and of speech-making are essentially diverse; by the one," says the writer, "you make yourself intelligible, and by the other unintelligible to your fellow-beings," and in poking fun at his friends in America, the author adds that "Speech-making is one of the greatest of American institutions." The machinery of celebrations requires it, a creak or two notwithstanding; but you would as little mention the creak as allude to the top notes of the Star-Spangled Banner."

Twenty-five years ago I used to wonder if a time would come when I could face an assembly as a speaker without tachycardia, or, as my learned teachers in those days would say, with a proper co-ordination of my visual, auditory, graphic, and articulatory centers. The time has never come, and on rising to speak, to this day, I feel like the man who returned to his hotel and forgot the number of his room and the name of his wife.

I remember well my first attempt. I was on the agenda to deliver an address to a students' association in Trinity College, on the subject of a bear's skull. The specimen was obtained during the excavation of some caves in the West of Ireland, and was given a present to my father. Political feeling was, as

usual, running high, and I expressed the view, as an expert geologist, that the bear to which the skull belonged lived contemporaneously with the primitive politicians in the West of Ireland, and that it was hard to see, if we believed in Darwin, why the politicians survived and the bears became extinct.

America has taught us the power of self reliance, we have felt the influence and have been stimulated by the example. Self reliance, power of initiative, fearlessness of responsibility, and fertility of resource has placed the American College of Surgeons in ten short years on a pinnacle of power, surrounded by the respect and admiration of the profession in every land.

I bring you fraternal greetings from the medical profession in Ireland on your tenth birthday and the hope that as one decade follows another you may continue with ever increasing momentum to advance and prosper, until finally your great efforts will triumph over the diseases which are decimating mankind and that you will be crowned by humanity itself with the laurels which belong to Victory.

Fellows of the American College of Surgeons, I beg to express the good fellowship of the Royal College of Surgeons and leave you tonight with

"Memories, images and prescious thoughts
That shall not die and cannot be destroyed."

THE RELATION OF THE ENDOMETRIUM TO OVARIAN FUNCTION[1]

By CHARLES C. NORRIS, M.D., F.A.C.S., and M. VOGT, M.D., Philadelphia

THE writers believe that the endometrium possesses a definite endocrinal function, and that this function operates in conjunction with the secretory function of the ovary, and is probably subservient to the latter. There can be no doubt but that the ovary is the dominant endocrinal factor of the female genital tract. It is equally apparent that the ovary functionates with other endocrinal glands, as for example, the thyroid. It appears almost certain that an interrelationship between the ovary and the endometrium exists, and that one structure is to some extent dependent upon the other.

Blair Bell was formerly of the opinion that the endometrium elaborated an internal secretion, but he subsequently discarded this view. Zweifel and Abel,[2] Doran,[3] Oliver,[4] Bond,[5] Lowenthal,[6] and others are of the opinion that the endometrium possesses an endocrinal function. Whether or not the endometrium possesses an endocrinal function is a difficult problem to solve with certainty. The results achieved by animal experimentation are by no means uniform or conclusive, for the eostrous cycle in animals differs in so many respects from the menstruation of women. Certain phylogenetic evidence refutes the theory, since the uterus is an organ that appeared comparatively recently in the course of vertebral evolution. However, many clinical facts point strongly toward the existence of an endocrinal function in the endometrium, and recently, as a result of the employment of radium in the treatment of so-called benign hæmorrhages, a large amount of additional clinical data have become available.

The importance of this question is at once apparent to the gynecologist and surgeon, and is of particular interest in view of the newer methods of treating uterine myomata by radiumization. It has, moreover, a distinct bearing upon the widely discussed topic of the relative merits of supravaginal hysterectomy and panhysterectomy, as well as upon the advantages of myomectomy. With this in mind, we submit the following evidence bearing upon the subject.

Perhaps little can be learned from the histological study of the endometrium. Nevertheless, the marked activity of the epithelium of the endometrium and the large amount of gland-like stroma present during the active sexual life of the female, are at least suggestive. The fact that the endometrium differs structurally from other endocrinal glands does not disprove this theory, since all the endocrinal glands are histologically dissimilar, and the evidence of their function is based almost entirely upon physiological and clinical findings.

The end-results that develop in patients subjected to supravaginal hysterectomy with conservation of the ovaries are extremely suggestive. A careful study of the after-histories of some 300 such cases shows that about 15 per cent menstruate scantily but regularly. These patients show the best end-results. There is a longer period before the occurrence of the menopause, and the nervous symptoms incident to the climacteric are less pronounced, simulating more closely those of the normal menopause. These patients enjoy a longer functionating ovarian life. In a second group the patients at once cease to menstruate, and no nervous symptoms develop, or the nervous symptoms of the menopause set in gradually some years after operation but, usually a few years earlier than in normal, unoperated upon women. This group constitutes about 65 per cent of hysterectomized patients upon whom ovarian conservation has been practised. A third group of patients cease to menstruate at once, and immediately or very shortly after develop definite menopausal symptoms. This group comprises about 20 per cent of all patients subjected to this form of operation.

[2] Zweifel and Abel. Ztschr. f. Gynaek., 1899, No. 21.
[3] Doran. Lancet, Lond., 1905, Nov.
[4] Oliver. Lancet, Lond., 1906, ii, 1684.
[5] Bond. Brit. M. J., 1906, July.
[6] Lowenthal. Arch. f. Gynaek., 1881.

[1] Read before the American Gynecological Society, May 22, 1923.

The explanation for the end-results in the first group is that the uterine amputation has been performed at a high level, and that functionating endometrium has been preserved. As regards the second group, it must be remembered that not infrequently normal, unoperated upon women are free from nervous symptoms at the menopause, or that a gradual atrophy of the ovaries may occur, due to operative interference with their circulation, a condition that finally results in cessation of the endocrinal function. A more plausible explanation is that there is a gradual disappearance of the function of the ovary due to a lack of interrelationship with the endometrium, which has been removed by operation. In explanation of the third group, which develop menopausal symptoms immediately or very soon after operation, it may be stated that this result is due to lack of function of the ovary. This group constitutes at least 20 per cent of all cases operated upon. If the nervous phenomena that occur in all of the members of the third group and in many of the second group were the result of ovarian degeneration incident to operative interference with the circulation of the ovary, it would appear that palpable finding or painful ovaries should be present in equal proportion to the menopausal symptoms. Such, however, is not the case, and the cystic degeneration is relatively infrequent. This disproportion will be very striking in all the series of such cases that are studied carefully.

In our own series of 171 cases[1] in which the ovaries were conserved, not a single patient required a second operation for degenerative changes in the ovaries, and at the meeting of the American Gynecological Society, at which our report was read, Culbertson[2] reported similar results in a still larger series. In our series the menopausal symptoms developed so much more frequently than did palpable or painful changes in the ovary that one is almost forced to believe that there must be a definite interrelationship between the ovary and the endometrium. Results that resembled these led Zweifel and Abel to draw similar conclusions. These results may perhaps be explainable on the ground of a gradual ovarian atrophy due to the circulatory disturbances incident to hysterectomy. It is generally conceded that the changes in the ovary due to operative interference are manifest by cystic degeneration. This is always painful, and can readily be recognized by palpation. For these and for other reasons we are inclined to look elsewhere for the explanation of why so relatively large a proportion of hysterectomized patients in whom one or both ovaries have been conserved suffer an early or exaggerated menopause. Graves is of the opinion that if the uterus is removed, an oophorectomy should also be performed, and that, in the absence of the uterus, the ovaries become functionless. We believe that, aside from its function in reproduction, the menstrual cycle has a marked effect upon the woman during her active sexual life.

All surgeons have observed the atrophic changes in the genital tract that follow bilateral oophorectomy. The nervous and psychic changes of the normal menopause are exaggerated in nervous or young women by any operation that tends to arrest the menstrual flow. Mayo[3] states that the effect upon patients is essentially the same, whether menstruation is checked by removal of the ovaries and retention of the uterus, or removal of the uterus and a conservation of the ovaries. He adds that he believes that menstruation itself has an important endocrinal function. Although we do not consider the uterus so important as the ovaries in the economy of the woman, a view such as that just expressed, emanating, as it does, from a careful observer, must be given due consideration. Our experience has been that ovarian conservation is of distinct value even when the entire uterus is removed, but that the ovaries function more satisfactorily if a part, at least, of the endometrium can be spared. In cases of bilateral salpingectomy with ovarian conservation the artificial menopause does not occur; if, however, the uterus is removed, a certain proportion of patients will be found to develop the nervous phenomena that are incident to

[1] Clark, J. G., and Norris, C. C. Surg., Gynec. & Obst., 1922, xxxiv, No. 4.

[2] Culbertson, C. Tr. Am. Gynec. Soc., 1921.

[3] Mayo, W. J. Northeast Med., 1922, xxi, 235.

ovarian afunction. Analogous results may be observed by comparing those patients on whom a myomectomy has been performed with those in whom a supravaginal hysterectomy with ovarian conservation has been practised. The former do not suffer from menopausal symptoms, whereas they are present in a proportion of the latter. In other words, as soon as the endometrium is removed, a definite proportion of patients will be found to suffer from menopausal symptoms.

No one who has examined a large series of uterine myomata would fail to be impressed by the relatively large proportion of specimens that exhibit greatly thickened or even polypoid endometriums. Histologically, such endometrium is frequently found to be of the premenstrual or early menstrual type. It is probable that the permanent premenstrual character of the endometrium is due to stimulation of the mucosa by the presence of the tumor. This in turn, we believe, stimulates the ovary by the internal secretion of the former, and accounts for the frequency with which hypertrophied ovaries occur in conjunction with these neoplasms.

Bleeding of the menorrhagic type is one of the most frequent and pronounced symptoms resulting from uterine myomata. In some cases the bleeding may be accounted for on a purely mechanical basis. In many cases, however, this explanation is untenable. The mechanical theory may account for an increase in flow during the menstrual period, but it would seem that the prolongation of the flow, which is so often a prominent feature, must be due to the long-continued stimulation that starts the bleeding. Furthermore, many cases in which there is no submucous tumor bleed excessively.

Kross[1] as a result of animal experimentation, leans to the belief that the uterine secretion contains a substance that delays coagulation and dissolves blood clots. This author is of the opinion that his experiments justify the theory that abnormal uterine bleeding not accounted for on anatomical grounds, i.e., due to neoplasms, etc., can be ascribed to the deviation from the normal physiology of the secretion formed by the endometrium.

[1] Kross, I. Surg., Gynec. & Obst., 1923, xxxvi.

An examination of our specimens of uterine myomata shows that in bleeding cases the endometrium is usually of the thickened, premenstrual type, unless actual invasion of the uterine cavity by the growth is present; even in this case that portion of the endometrium not subjected to pressure often exhibits this change. Certainly the mechanical theory does not apply to all cases. If we accept the theory of endocrinal function of the endometrium, a ready explanation is at hand. In those cases of diffuse adenomyoma of the uterus, the mechanical theory is still less acceptable. These patients almost always suffer from menorrhagia, practically all exhibit the thickened, premenstrual type of mucosa, and, in addition, the uteri contain considerable endometrium-like tissues in the depths of the myometrium. The endocrinal theory offers a probable and perhaps the most satisfactory explanation in this case.

The strongest argument for the theory that the endometrium possesses an endocrinal function is probably found in the study of patients who have been subjected to radiumization. In 94 per cent of cases 1000 millicurie hours of radium applied to the interior of the uterus checked all uterine hæmorrhages due to small or medium-sized myomata and other so-called benign bleedings.[1] For these cases radiumization may be considered almost specific. Its chief disadvantage is that, when applied to women who still menstruate, it produces a severe artificial menopause. This fact is so well recognized that in young women most gynecologists prefer to practise supravaginal hysterectomy with conservation of the ovaries unless the more radical operative intervention is contra-indicated for some other reason. In the radiumized patient the menopause is quite as severe as that which follows a panhysterectomy and bilateral salpingo-oophorectomy. Two theories as to the manner in which radium checks hæmorrhage in these cases have been advanced. One, that the rays prevent the development of the ovarian follicles; in other words, castrates the woman; and the other, that the action of the rays is merely local, affecting only

[1] Clark and Keene. J. Am. M. Ass., 192

the uterus and the tumor. Kelly[1] is inclined to believe that both theories are correct.

The recent experimental work of Weis[2] would indicate that radium produced only a local effect. Even if we assume that by its action on the ovarian follicles it does destroy the functionating power of the ovary, it is almost impossible, considering its limited range of effectiveness, to assume that in 94 per cent of cases one dose would, in every case, destroy the function of the ovaries. This is particularly the case when we recall the abnormal position often occupied by the ovaries in cases of uterine myomata. It would seem extremely likely that in more than 6 per cent of cases one ovary, at least, would be so far removed from the seat of radiumization that it would escape the action of the rays. If, in these cases, the arrest of the hæmorrhage is due to the local destructive action of radium on the uterus and the tumor, it is convincing evidence of the endocrinal function of the endometrium. If we accept the endocrinal theory, the results are, in either event, explainable.

All other things being equal, it is, therefore, preferable, when performing hysterectomy with conservation of one or both ovaries, to preserve a portion at least, of the endometrium. In many cases this course is eminently practical. Histological and bacteriological examinations have shown that the leucorrhœa due to cervical infections originates chiefly from the lower half of the cervix, which is not generally removed by supravaginal hysterectomy. In 80 per cent of cases, carcinoma of the cervical stump arises from squamous epithelium, and even more rarely from the upper part of the cervical canal. The incidence of carcinoma of the cervical stump is, therefore, not materially decreased by a low supravaginal amputation. In many cases of supravaginal hysterectomy it is quite possible and advisable to perform the amputation at quite a high level. Moreover, this facilitates the operation. We believe that, even if all the endometrium is removed, the conservation of an ovary is still of value, but that the ovary functions better if a portion, at least, of the endometrium can be preserved.

[1] Kelly, H. A. Medical Gynecology, 1920.
[2] Weis, H. C. Surg., Gynec. & Obst., 1923, xxxvi, 373.

It is probable that the endocrinal action of the endometrium fluctuates with the menstrual cycle, just as the function of the ovary varies, and that its greatest activity is in the premenstrual stage—the stage that is so often found permanently in bleeding myomata.

The preceding work is presented in the form of a preliminary report. As has been stated, the theory attributing an endocrinal function to the endometrium is open to doubt, although clinical evidence is strongly corroborative. We hope soon to be able to present the results of the experiments bearing upon this subject. If it can be definitely proved that the endometrium functions as an endocrinal gland, many problems hitherto perplexing, will be solved. It is possible that the nausea that occurs during radiumization of the uterus, as well as other conditions, such as certain of the dysmenorrhœas that so often occur in patients with normal ovaries, the nausea of early pregnancy, etc., may be accounted for by assuming the endocrinal action of the endometrium.

CONCLUSION

1. The theory that the endometrium possesses an endocrinal function is at present based only upon physiological and clinical proof. The fact that the endometrium differs histologically from other endocrinal glands is no argument against the theory, since all other endocrinal glands differ one from the other, in this respect.

2. The endometrium probably possesses a definite endocrinal function, which, like other endocrinal glands, acts in conjuction with certain so-called ductless glands, particularly the ovary, to which it is most likely subservient.

3. The endocrinal function of the endometrium probably fluctuates with the menstrual cycle, being most active during the premenstrual period.

4. The chief clinical evidence on which this theory is based lies in the established fact that the proportion of women who suffer from nervous phenomena after a hysterectomy with conservation of one or both ovaries is much greater than that of those who exhibit painful or palpable changes in the conserved ovary.

5. The most conclusive evidence is found in those patients who have been treated with radium for the arrest of benign hæmorrhages. It is difficult to conceive that in almost every case so treated both ovaries are rendered functionless. Furthermore, there is much experimental evidence that tends to show that in these cases the action of radium is limited to the uterus.

6. In operations upon the uterus, ovarian conservation is of distinct value, even if panhysterectomy is performed; the ovaries function better, however, and have a longer funtional life, if a portion of the endometrium can be preserved.

7. The thickened and permanent premenstrual stage of the endometrium, so frequently present in patients suffering from uterine myomata, is the result of stimulation of the endometrium by the presence of the tumor, and accounts for the prolonged bleeding that is often present.

LATE ULNAR NERVE PALSY

By EDWIN M. MILLER, M.D., Chicago

THE lesions of peripheral nerves associated with fractures are generally classified according to the time at which the signs of nerve involvement appear, namely: primary, secondary, and late. The *primary* lesion occurs at once at the time of injury, but is often overlooked, only to appear after removal of the splint or dressing. It may vary in severity from a simple contusion of the nerve trunk to a complete anatomical division. The *secondary* lesion comes on gradually during the weeks of bone repair and is due, as a rule, to a stretching of the nerve over growing callus or displaced bone fragment, pinching between the ends of bone fragments, or its inclusion within callus or scar tissue. Whatever its cause may be, the lesion is apt to be permanent unless surgically relieved. The *late* paralysis is peculiar in this respect, that it makes its appearance many years after the fracture occurs, and in some instances long after the accident has been forgotten. It is to this type of lesion that the author will confine his remarks.

Panas (10), in 1878, was the first to call the attention of the medical profession to this clinical picture. To his clinic came a cobbler about 40 years of age complaining of wasting of the muscles of his right hand so that he had difficulty in using his hammer in the mending of shoes. Many years before he had broken his arm at the elbow, but aside from a deformity at his elbow it never gave him any trouble until 6 months before coming to the surgeon, within which time a complete ulnar nerve palsy had developed.

It was not until 1898, however, that Albert Mouchet (7) in his doctor's thesis at Paris completely analyzed this clinical picture, clearly demonstrated its most common etiological factor, and submitted a rational method for surgical relief of the paralysis. Since that time there have appeared many notable papers; in France, by Mouchet and Broca (8), Guillemain and Mally (3), LeClerc (6), Redard (12) and Sengensse (13); in Germany by Siegfried Peltesohn (11) and Staffel (17); in England by Sherren (15) and Bowlby (1); and in this country by Ramsay Hunt (5), Murphy (9), and Walter Shelden (14).

From a careful analysis of this literature and from a direct study of clinical cases, the following facts may be set down as being characteristic of this clinical picture:

1. The primary cause in practically all cases of late ulnar nerve palsy is a fracture at the elbow in childhood, usually between the third and fifth year.

2. Although occasionally the site of injury may be at the internal condyle or in the supracondylar region, in the vast majority of cases the line of fracture begins laterally just below the epicondyle and passes ob-

liquely downward and inward into the joint, causing a complete separation of the external condyle (capitellum).

3. The broken capitellum is displaced laterally and forward, and the fractured surface is twisted outward, is not accurately reduced by manipulation, and as a result non-union of the condyle occurs. The growth of the humerus on its lateral side is thus interfered with to such an extent that a cubitus valgus gradually develops.

4. As the deformity increases the olecranon process becomes impinged against the medial condyle, the ulnar groove becomes but a shallow depression and the nerve itself displaced from its bed, where it becomes subjected not only to stretching when the arm is flexed and extended but to repeated slight trauma which in time leads to partial or complete ulnar palsy.

5. This paralysis may begin as early as 3 years or as late as 40 years after the injury, but in the majority (40 per cent) of cases it is noticed between the twentieth and thirtieth year after the fracture occurs.

The methods of *treatment* after the palsy has developed may be grouped under the following heads:

1. Correction of the deformity at the elbow by a cuneiform osteotomy of the humerus, no operation on the nerve itself being necessary.

2. Simple liberation of the nerve from its bed.

3. Liberation of the nerve at the elbow and replacing it in a new groove made by removal of a wedge-shaped piece of bone and lining it with an aponeurotico-fascial flap.

4. Transplantation of the nerve to the flexor side of the elbow.

Each of these methods has received the enthusiastic support of noted surgeons. Mouchet himself, after carefully weighing the merits of each, chose the first, and his clinical end-results, in a small series of cases, bear out the wisdom of his judgment. Simple liberation of the nerve, though often tried, has been shown to be insufficient, in that it fails to change the etiological factors. Deepening of the ulnar groove, though theoretically correct and used with good results by Broca, and Guillemain and Mally, is open to the objection that regeneration of bone may fill the deepened groove and that the nerve may become easily involved in scar tissue. Of all the methods, the last has best stood the test of time, and in this country has been the most popular method of treatment.

The author desires to present the following cases,[1] most of which have come under observation at the Presbyterian Hospital.

CASE 1. E. H., male, age 32. At the age of 7 years he fell and fractured his right elbow. The fracture repaired in due time and he suffered no ill effects from the injury, except for a deformity at the elbow, until he was 29 years old, when he noticed numbness and tingling along the little finger and inner edge of the hand, which was relieved somewhat by massage. After about 3 months the massage lost its effect and the area involved became quite numb. There has been a gradual but progressive wasting of the muscles of the hand. The condition was aggravated for a time by an injury to the elbow in a railroad wreck a short time after the onset of the symptoms.

He was admitted to the Presbyterian Hospital, November 22, 1910, presenting a typical picture of ulnar nerve paralysis with marked muscle atrophy. At operation, performed by Dr. C. J. Rowan, the ulnar nerve was flattened out over the prominent internal condyle of the humerus. The ulnar groove was very shallow. The nerve was freed, and placed in a new groove made by chiseling out a wedge-shaped piece of bone.

Within 3 months improvement in the condition of the hand was noticed, and the progress was continuous for about 1 year, after which time he took up golf to aid in the development of the muscles of his hand.

When examined by the author April 18, 1922, there was a marked cubitus valgus, and a thickening in the region of the prominent internal condyle. The external condyle was freely movable. The ulnar nerve could be felt in the groove, and as it was rolled under the finger a tingling was felt along its sensory distribution in the hand. There was crepitus at the elbow on motion. No atrophy of the muscles of the forearm or hand was noted. Opposition of the little finger was normal. Adduction and abduction of the fingers were present but weak. Adduction of the thumb was normal. There was no disability for ordinary uses of the hand, and in playing golf the grip was strong. The only thing he noticed was a slight tingling sensation at times in the ring and little fingers.

X-ray (Fig. 1) made at that time showed an old ununited fracture of the external condyle of the

[1] The first four cases were included in the report on "Peripheral Nerve Injuries Associated with Fractures," by Dean Lewis and Edwin M. Miller, published in full in the *Transactions of the American Surgical Society*, 1922.

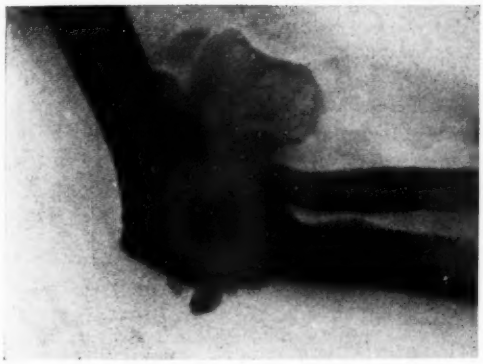


Fig. 1. Case 1. Ununited fracture of external condyle in childhood. Cubitus valgus. Ulnar nerve palsy beginning 22 years after injury.

humerus which was markedly atrophied, several small loose bone fragments near the medial condyle, and a marked cubitus valgus.

The result in this case is as striking as any that have been reported following this type of operation, and in view of the long duration of the paralysis is remarkable.

Case 2. J. W., male, age 24. At the age of 4 years he fell while playing and sustained a fracture of the left elbow, which was reduced at once and healed with a slight deformity in normal time. About 3 years later a slight wasting of the left hand was noticed by his parents and he was given instruction in the violin, with the sole purpose of developing the wasting muscles, and he achieved some degree of success. He played constantly until the time he entered the army service, but had difficulty with the ring and little fingers on the A and E strings. The deformity caused him very little inconvenience but he always carefully guarded the point of the elbow, as a slight blow in that region practically paralyzed the hand for 15 or 20 minutes. If the arm was kept bent for any length of time, as in sleeping, reading, carrying the hand in his pocket or leaning upon a desk, the hand became quite cold and numb. In lifting or carrying a weight, most of the strain fell upon the middle finger, as the ring and little finger were quite useless.

X-ray (Fig. 2) made March 16, 1923, showed an old ununited fracture of the external condyle of the humerus which was markedly atrophied. There was also atrophy of the radius, and an extreme degree of cubitus valgus. On the medial side of the elbow there were apparently two loose pieces of bone; one about the size of an olive and the other the size of a kidney bean.

Examination on March 16, 1923, when he entered the Presbyterian Hospital, showed an extreme ulnar

Fig. 2. Case 2. Ununited fracture of external condyle in childhood, with growth disturbance resulting in marked cubitus valgus and complete ulnar nerve palsy.

nerve palsy with marked muscle atrophy. The ulnar nerve felt enlarged where it passed behind the prominent medial condyle in its shallow groove. When it was rolled under the palpating finger a tingling was felt in the ring and little fingers. In view of the long standing paralysis and extreme muscle atrophy relief by any operative interference was not considered at all probable, but owing to the insistence of the patient the operation was performed March 16, under local anæsthesia.

Through an incision along the flexor aspect of the medial condyle, the ulnar nerve was exposed for a distance of 6 inches (Fig. 3, A). When the covering of deep fascia was incised the nerve seemed to bulge into the wound as if it had been pinched between the shallow groove and overlying dense fascia. It was red-gray in color, œdematous, and enlarged fully twice the normal size as far down as its entrance into the flexor muscles. With an aneurism hook it was gently lifted from its bed (Fig. 3, B), freed from the adherent connective tissue, and placed along the flexor aspect of the medial condyle above the deep fascia where it was tacked by folding over a very thin layer of areolar tissue in two places (Fig. 3, C). After closing the skin with silk, the arm was placed in a sling.

Case 3. J. H., male, age 46. Forty-two years ago he fractured the left elbow. He does not remember having any trouble with the arm, except for occasional cramps, until about 36 years later when he took up golf. He noticed that the grip of the left hand was a little weak and that he was holding the shaft of the club with the tip of the thumb rather than the proximal part. Later on he noticed a wasting of the muscles of the back of the hand and the cramp-like pains became more constant. He presented himself at the Presbyterian Hospital in 1919, on the service of Dr. Carl Davis, with a complete ulnar nerve palsy.

At operation the nerve was exposed through a median incision. There was a bulbous enlargement and the nerve was adherent in scar tissue. The adhesions were freed, the sheath opened, and a small adherent neuroma seen. This was freed from adhesions but not removed.

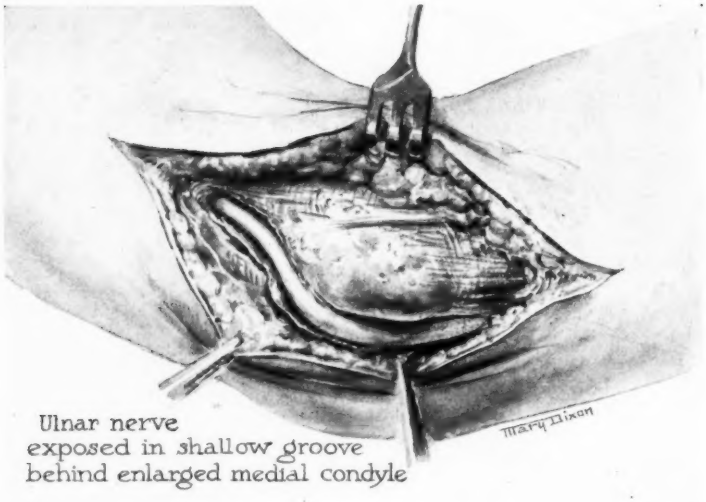


Fig. 3A. Ulnar nerve exposed in shallow groove behind enlarged medial condyle.

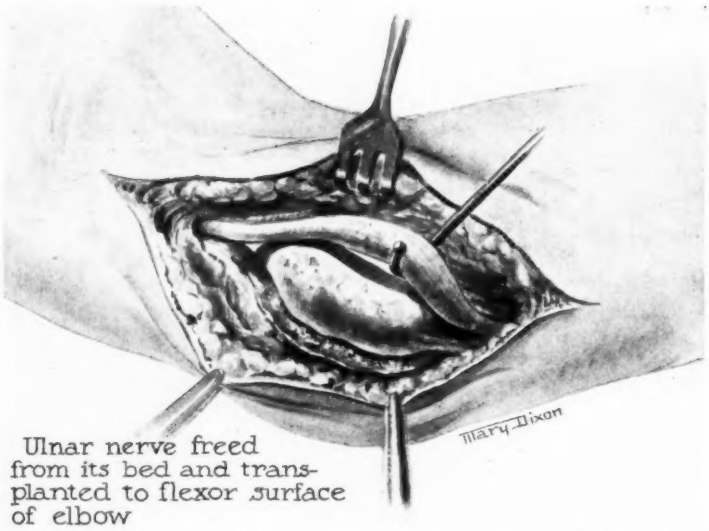


Fig. 3B. Ulnar nerve freed from its bed and transplanted to flexor surface of elbow.

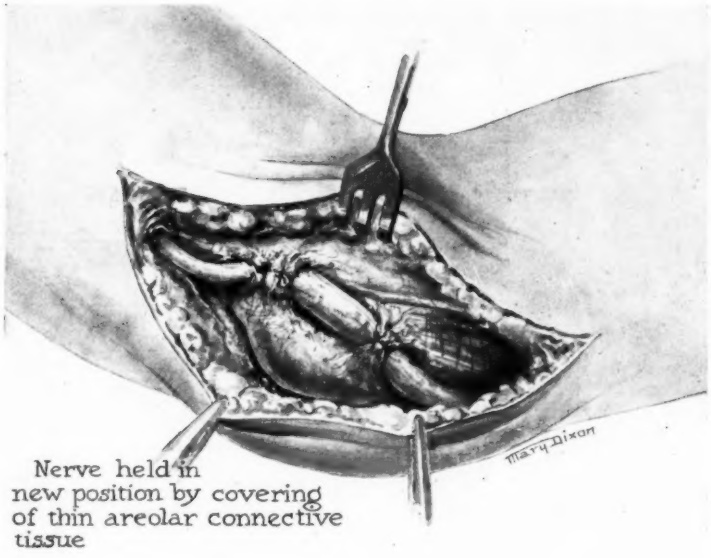


Fig. 3C. Nerve held in new position by covering of thin areolar connective tissue.

The X-ray made at the time of operation (Fig. 4) showed an old ununited fracture of the external condyle with extreme cubitus valgus. The loose condyle and upper end of the radius were atrophied.

Result. The patient states that about one year after operation the pain began to subside. When seen by the author in 1923 he was entirely free from discomfort. There was occasionally a tingling along the edge of the hand and little finger, but the sensation over the ring finger has returned to normal. The muscle atrophy still remains, although the disability for ordinary use is slight.

CASE 4. Dr. P. At the age of 10 years he fell and broke the left elbow. He remembers that the surgeon spoke of it as a T-shaped fracture, that the flesh was torn so that the bone protruded, and that it was about 6 months before the wound was entirely healed. At the age of 18 years he fell and broke the same elbow again. No X-rays were made, but the fracture repaired in normal time and he had good function in spite of a gun-stock deformity. About 15 years later (at the age of 33 years), while a medical student in the dissecting room, he first noticed pain in the ring and little fingers when the elbow was held in the flexed position for a long time. This gradually became more noticeable, and within 18 months he had developed almost a complete ulnar nerve palsy. An X-ray (Fig. 5) made in March, 1920, showed an old fracture involving the region of the capitellum and also the trochlea. Both of these and two small fragments in the region of the olecranon fossa appear to be ununited to the supracondylar portion. A cubitus varus is present. A letter from this patient April 11, 1922, says, "At present there is partial anæsthesia and loss of sensation of pressure over the ulnar side of the hand, little finger, and exactly one-half of the ring finger. The motor function of the nerve seems almost unimpaired, except that the adductor pollicis and interossei are atrophied. One can feel the thickened nerve at the elbow."

This case differs from the others in that a gun-stock deformity existed rather than a cubitus valgus. The late involvement of the ulnar nerve was evidently due in this case to the nerve having been displaced from its normal groove at the time of the fracture and exposed to long-continued trauma.

CASE 5. B. B., female, age 30 years. When a child she fell while playing and broke the right arm at the elbow. After healing had occurred she had no trouble with the arm until about 18 years later, when she began to have tingling sensations along the ulnar side of the hand and fingers. A weakness of the hand gradually developed and within a year complete ulnar nerve palsy was present.

Upon entrance to the Presbyterian Hospital an X-ray (Fig. 6) showed an old ununited fracture of the external condyle of the humerus with marked cubitus valgus. The loose condyle was much atrophied and displaced anteriorly and laterally.

Fig. 4.

Fig. 5.

Fig. 4. Case 3. Ununited fracture of external condyle in childhood with resultant cubitus valgus. Ulnar nerve palsy beginning 36 years after injury.

Fig. 5. Case 4. Compound fracture involving the external condyle of the humerus in boyhood, resulting in a gunstock deformity at the elbow. Onset of ulnar palsy 23 years after the injury.

Fig. 6.

Fig. 7.

Fig. 6. Case 5. Old ununited fracture of the external condyle of the humerus in childhood, with development of cubitus valgus and ulnar nerve palsy beginning 18 years after injury.

Fig. 7. Case 7. Ununited fracture of external condyle at age of 4 years. Cubitus valgus. First signs of ulnar nerve palsy beginning 15 years after injury.

Fig. 8.

Fig. 9.

Fig. 10.

Fig. 8. Case 8. Old ununited fracture of external condyle of humerus at 4 years of age. Marked cubitus valgus and shallow ulnar groove. No evidence of ulnar palsy at present.

Fig. 9. Case 9. Fracture of external condyle of humerus at 4 years of age. Union of fragment to shaft did not prevent development of cubitus valgus. No evidence of ulnar palsy at present.

Fig. 10. Case 9. Separation of epiphysis of external condyle in childhood with growth disturbance resulting in cubitus valgus. There is no involvement of the ulnar nerve as yet.

The ulnar groove was very shallow. The patient was operated on February 1, 1923, by Dr. Phemister who found the ulnar nerve to be flattened out over the prominent medial epicondyle and much enlarged. It was transplanted to the flexor aspect of the elbow beneath a layer of the deep fascia.

CASE 6. D. M., male, age 26 years. When he was a boy he fell out of bed and broke the right elbow. In 1917 (18 years after the injury), he first noticed a wasting of the muscles of the right hand and of late he has observed a weakness of the muscles of the inner aspect of the forearm. He

Fig. 11. Fig. 12. Fig. 13.

Fig. 11. Case 10. Fracture of the external condyle in childhood with cubitus valgus, but without ulnar nerve involvement.

Fig. 12. Boy aged 4 years. Fracture of external humeral condyle which is displaced outward, upward, and forward. The line of fracture is directed laterally.

Fig. 13. Boy 4 years of age. Showing the displacement of the fragments of the fractured external humeral condyle.

entered the Presbyterian Hospital January 26, 1923, on the service of Dr. Dean Lewis, presenting a typical ulnar nerve palsy except for the lack of sensory disturbances. The X-ray showed an old ununited fracture of the external condyle of the humerus and a marked cubitus valgus. At operation the ulnar nerve was much swollen and flattened out to a diameter of one-half inch where it lay stretched out over the prominent medial condyle. The nerve was lifted to the anterior aspect of the elbow and anchored by interrupted stitches to the deep fascia.

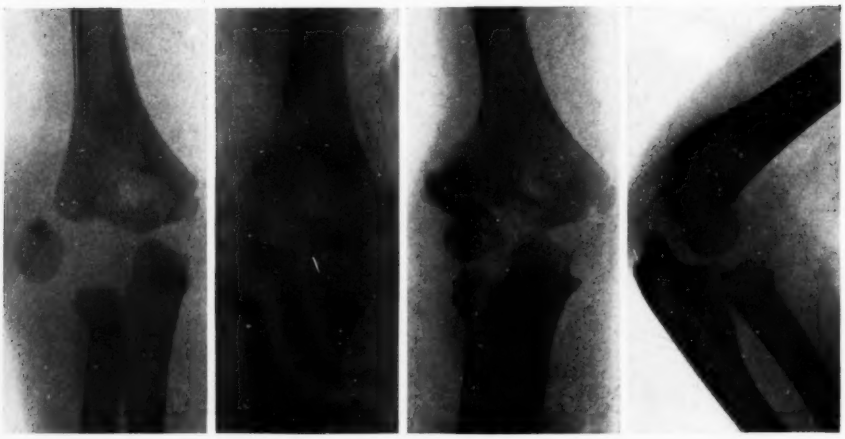
Case 7. A. H., female, age 42. At the age of 4 years she fell and fractured the left elbow. After the injury had healed she had no trouble with the arm until about 15 years later, when she observed tingling along the ulnar side of the hand and last two fingers. This has been present off and on ever since, of late being associated with a weakness of the hand, for the relief of which she has received osteopathic treatments without noticeable improvement.

Examination by the author in February, 1923, revealed a marked cubitus valgus and a beginning atrophy of the hypothenar, interossei, and adductor pollicis muscles. The X-ray (Fig. 7) shows exactly the same condition as have all the other cases, namely: An old ununited fracture of the external humeral condyle with marked cubitus valgus, and an obliteration of the ulnar groove. At operation, May 8, 1923, the ulnar nerve appeared to be pinched between the deep fascia and the floor of the shallow ulnar groove. It was transplanted to the front of the elbow. Five and a half months have elapsed since the operation and we find that the pain is practically gone, atrophy of muscles is less noticeable, and the motor power nearly normal.

Case 8. T. L., male, age 23. When he was about 4 years old he fell off a kitchen table and fractured the left elbow. The arm was set under anæsthesia several times and a cast finally applied. The fracture healed in normal time and he had no trouble whatever with the arm, until about 3 years ago when he was husking corn and felt several times a tingling sensation along the ring and little fingers. When he was examined by the author in February, 1923, a marked cubitus valgus was present and the ulnar nerve could be easily rolled under the finger in a very shallow groove. No signs of nerve paralysis existed. The X-ray (Fig. 8) shows an old ununited fracture of the external humeral condyle with lateral and upward displacement of the atrophied loose fragment. The ulnar groove is very shallow. This case is of particular interest in that the nerve palsy has not as yet put in its appearance. It is difficult to see how it can help but develop in the next few years unless operative interference is instituted.

Case 9. V. W., female, age 22 years. At the age of 4 years she fell while walking a picket fence and caught the right elbow between the pickets. A cast was applied. When this was removed several weeks later the angulation at the elbow was noticed by the mother, and for a long time she made the child carry heavy weights to straighten the arm. It never gave her any trouble until about 2 months ago, when she noticed tingling sensations in the ring and little fingers when holding the arm for a long time in the writing position.

She was seen by the author in February, 1923, and the marked cubitus valgus was noticed (Fig. 9). The ulnar groove was very shallow, but no signs of



a. *b.* *c.* *d.*

Fig. 14. *a*, Fracture of external condyle in boy of 6 years. Fragment displaced laterally and fractured surface twisted outward. Reduction by manipulation unsuccessful.
b, Reduction by open operation. Alignment good in anterior view, but reduction not perfect.
c, Four months after operation. Considerable callus present with imperfect union of fragment.
d, Lateral view 4 months after operation showing the capitellum imperfectly reduced as compared with the normal elbow at the same age.

nerve paralysis were present. The X-ray (Fig. 10) shows an old fracture of the external condyle which has united to the shaft. A marked cubitus valgus is present.

It is quite probable that in this case the injury caused a separation of the epiphysis without displacement, but the trauma to the cartilage plate was sufficient to interfere with growth enough to produce in later years a cubitus valgus. It is quite probable also that as time goes on the evidence of involvement of the ulnar nerve will become more noticeable. In such an event it would seem advisable to transplant the nerve to the front of the medial condyle.

CASE 10. A. A., age 30 years. At the age of 4 years he fell while playing and broke the right arm at the elbow. He has never had any trouble with the arm since that time, but he has noticed that the carrying angle has become more acute than on the normal arm. He plays the piano a great deal and has never been hindered by the deformity. There is no sign of involvement of the ulnar nerve. The X-ray (Fig. 11) made March 2, 1923, shows the old fracture of the external condyle which has become loosely united to the shaft and has produced by its disturbance in growth the cubitus valgus. The ulnar groove is very shallow.

In this case, even though no evidence of nerve involvement exists at the present time, we would expect in later years to find beginning ulnar palsy, inasmuch as the nerve has become very superficial as a result of the shallow groove and will undoubtedly become subjected to repeated trauma and stretching.

Since the most common type of injury producing the growth disturbance leading to a cubitus valgus and in later years to an ulnar nerve palsy is a fracture of the external condyle in childhood, it would seem that the attention of surgeons ought to be directed toward a method of treatment of this type of injury which would obviate if possible these serious late results. While it is true that the percentage of late ulnar palsies is very small in proportion to the frequency of external condyle fractures, it is quite probable that the valgus deformity is much more common than we would think, and also that if these cases could be traced long enough it would be found that involvement of the ulnar nerve occurs more frequently than the published reports would indicate. At any rate it cannot be denied that the treatment of these injuries deserves serious consideration.

By way of illustration, I cite the following two cases:

Fig. 15. Roentgenograms of normally developing elbow.
a, 4 months. No centers of ossification have appeared in the humeral epiphysis.
b, 3 years. Center of ossification in capitellum present.
c, 5 years. Centers of ossification in capitellum and internal epicondyle present.
d, 5 years. Lateral view showing the relation of the capitellum to the sigmoid notch of the ulna and the shaft of the humerus.
e, 8 years. Lateral view showing the relation of the capitellum, trochlear shadow, and medial epicondyle to the humeral shaft.
f, 8 years. Anterior view showing the three centers of ossification of the epiphysis, capitellum, trochlea, and medial epicondyle.

J. V., age 4 years, came to the Central Free Dispensary November 21, 1922, with a history of having fallen out of bed 4 weeks previously and broken the right elbow. It was put up in splints by the neighboring doctor but the progress had not been satisfactory. On examination there was found a prominence on the lateral aspect of the elbow and crepitus on motion, which was limited both in flexion and extension. The X-rays (Figs. 12 and 13) made January 27, 1923, 3 months after injury, show a fracture of the external condyle of the humerus which is split in two pieces, both displaced laterally and upward, and the larger one forward. Their fractured surfaces are directed upward and laterally. It is quite obvious that under such circumstances there is not even a possibility that union of the fragments with the shaft can occur, and if that is true there is bound to be growth disturbance on the lateral side of the humerus which will lead to a cubitus valgus, and in later years perhaps to an ulnar palsy.

Haas (4), of San Francisco, has shown experimentally and it has recently been emphasized by Speed (16) that the two main factors producing growth disturbance at the epiphyseal line are injury to the cartilaginous plate of the epiphysis and interference with its blood supply, both of which are present in this case. It seems to us that instead of being content to put this child's elbow up in the flexed position according to the accepted rule, it would have been better to operate at once and make as accurate a reduction of the fragments as possible with the hope that growth disturbance would be minimized if not wholly prevented.

It was with this idea in mind that the following case came to operation:

J. C., age 6 years, entered the dispensary September 28, 1922, with the history of having fallen from a fence and injured the right elbow. Examination showed marked swelling and ecchymosis about the elbow and acute tenderness on the lateral side where a bony prominence was felt. The X-ray (Fig. 14, a) showed a fracture of the external con-

dyle of the humerus which was displaced laterally and rotated so that the fractured surface was directed outward. He was admitted to the Presbyterian Hospital and came to operation October 6, 1922. Through a lateral incision the supinator longus was retracted forward exposing the loose condyle with its articular surface in contact with the fractured surface of the shaft. With some little difficulty it was replaced and held in position by closure of the fascia. A molded splint was applied in the right angle position. The X-ray (Fig. 14, b) made a few days later showed good alignment in the anterior view, and it was thought that a very good reduction had been made. Four months later, however, when another picture was made (Fig. 14, c and d) it was found that even though considerable callus had been formed, there was not solid union and the fractured condyle was still displaced upward and forward from its normal position. This will be readily seen in comparison of Figure 14, d and Figure 16, d, which is a lateral view of the normal elbow of a boy about the same age. It has been recently shown by Cohn (2) of New Orleans, that at this age a line drawn longitudinally through the middle of the humeral shaft will just touch the posterior edge of the external condyle, so that in our case there is fully 6 millimeters, anterior displacement of the loose fragment. This is without doubt sufficient displacement seriously to interfere with the growth of the lateral half of the humerus. If we had fixed this loose fragment accurately in contact with the shaft with a small nail for a time it probably would have been much better. It will be of interest to follow both of these cases in later years to see whether a cubitus valgus develops.

CONCLUSION

Fractures of the external condyle of the humerus, which occur most often in childhood, should be operated on if the loose fragment cannot be accurately reduced by manipulation because the growth disturbance following non-union is very likely to result in a marked valgus deformity which may in later years produce a paralysis of the ulnar nerve. If this occurs, it is the duty of the surgeon to relieve the tension on the ulnar nerve as soon as the first signs of paralysis appear, either by a correction of the deformity, as recommended by Mouchet, or by transplantation of the nerve to the flexor surface of the elbow.

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PRIMARY CARCINOMA OF THE URETER

With a Report of a Case and a Review of the Literature[1]

By HERMAN L. KRETSCHMER, M.D., F.A.C.S., Chicago

Of the malignant tumors occurring in the ureter, carcinomata are more common than sarcomata. Carcinoma occurring in the ureter may be primary or secondary. Secondary carcinoma may originate in the kidney pelvis by direct extension, or the ureter may be involved by a carcinoma of the bladder. The ureter may also be involved secondary to a carcinoma of the uterus or the ovary.

In a recent article, Aschner was able to collect 47 cases of primary tumors of the ureter, including both benign and malignant cases. It would thus appear that primary epithelial tumors in the ureter are rare.

This paper will be limited to a consideration of primary carcinoma of the ureter. From the available literature I have been able to collect 34 cases to which I wish to add a case under recent observation, thus bringing the total number of cases for discussion up to 35. The history of the case under recent observation follows:

G. M., age 74, referred by Dr. Charles Collester. Twenty years ago patient was operated upon for carcinoma of the lip. Complete cure. Patient was well until five weeks before he came under observation when he began to pass dark red urine. Since the onset of the trouble the urine was never entirely free of blood. The amount of the bleeding varied so that at times the urine was either very dark red or light red. Blood and urine were well mixed: occasionally clots were passed. Nocturia has been present for several years. During the last 2 months he has lost about 10 pounds in weight.

General physical examination was negative. The scar from the previous operation for carcinoma of the lip was normal. No local recurrence. Kidneys, ureters, and bladder negative. Rectal examination showed a slight enlargement of both lateral lobes of the prostate.

Cystoscopic examination showed a definite trabeculation of the kidney and at the vesical neck a large median bar. The ureteral orifices were normal. No signs of tumor in the bladder or in or around the ureteral orifices were present. The ureters were catheterized without difficulty or obstruction.

A pyelogram was made and on the right side the catheter took a most unusual course, i.e., upward and outward in an S-shaped curve, the tip overlying the midpart of the crest of the ilium. At the level of the second lumbar a dense rounded shadow was seen, the size of a half dollar. There was marked lipping of the lumbar spine and thickening of the sacro-iliac joint. No stone shadows were seen (Fig. 1).

Cell count and cultures were as follows:

	Leucocytes per cubic millimeter	Cultures	Tuberculosis
Bladder	310	Sterile	Negative
Right kidney	190	Sterile	Negative
Left kidney	50	Sterile	Negative

Operation, September 3, 1922. The patient left the city and returned to his home where he was operated upon by Dr. Phemister, to whom I am indebted for his kindness in turning over the specimen to me for study. The usual oblique lumbar incision was made over the right side and a lumbar nephroureterectomy was performed. The patient made an uneventful recovery.

SEX

According to the cases reported the incidence of sex seemed to play little, if any rôle. Males were more frequently affected than females, but the difference was so slight as to be negligible. The number of males, including the case here reported, is 19; females, 16.

AGE

Here, as in other forms of malignant disease of the urinary tract, it may be stated that carcinoma occurred with greater frequency in advanced years, although there were exceptions to this statement. The exceptions were the cases of Albarran, 36 years; Finsterer, 35 years; Zironi, 36 years; Aschner, 38 years. There were two patients, aged 80: one reported by Richter, the other by Toupet and Guebiat. Curiously enough both these patients were females. The following table shows the incidence of age.

	No. of cases
30 to 39	4
40 to 49	7
50 to 59	9
60 to 69	9
70 to 79	2
80 to 89	2
Age not stated	2

[1] Read at the annual meeting of the American Association of Genito-Urinary Surgeons, Cleveland, May 17–18, 1923

Fig. 1. Roentgenogram showing the course of the ureter and the incompletely filled kidney pelvis.

PRESENCE OF CALCULI

Although it has repeatedly been stated that the presence of stone may be an etiological factor in causing carcinoma, and in order to support this statement attention has been called to the frequency with which stones and carcinoma of the gall bladder are found at the same time, it would seem that in the urinary tract, stones and carcinoma do not occur simultaneously as often as in the biliary tract. Evidently stone is of no moment as an etiological factor in causing carcinoma of the ureter since only in 5 cases was it present. Its occurrence in the ureter has been mentioned by Davy, Metcalf and Safford, Paschkis and Zironi. In Judd and Struthers' case, the patient stated that he passed a stone. In the St. Thomas Hospital case, stone was present in the opposite kidney, and in Aschner's case it was found in the kidney on the corresponding side.

PATHOLOGY

Type of tumor. From a review of these 35 cases it appears that the papillary form of carcinoma occurs most frequently in the ureter, since 18 of the 35 cases were of this type. Next in point of frequency were the medullary carcinomata, 5 cases, and the squamous celled carcinomata, 5 cases. In one case the tumor was described simply as an epithelioma. No further histological description was noted. Epithelial carcinoma was the term used to describe 2 cases. In 2 cases the tumor was described as transitional celled carcinoma. In 1 case the term carcinoma solidum simplex was used and in another case, simply carcinoma.

Since squamous cells are not normally present in the renal pelvis, the presence of squamous celled carcinoma brings up for discussion the interesting question of metaplasia, the occurrence of which has been previously discussed.[1]

	No. of cases
Papillary carcinoma	19
Squamous-celled carcinoma	5
Medullary carcinoma	5
Epithelial carcinoma	2
Transitional-celled carcinoma	2
Epithelioma	1
Carcinoma solidum simplex	1
Carcinoma	1

One of the most constant concomitant pathological findings is hydronephrosis. This is but a natural development as it is the direct result of the tumor producing a stricture or obstruction within the ureter, with a resulting hydronephrosis above the obstruction. Hydronephrosis has been recorded as present in 26 of the 35 cases. In 9 cases neither the presence nor absence of hydronephrosis was noted. It is possible that the real incidence of hydronephrosis is larger than appears from a review of the literature since some of the authors may have neglected to report its presence. In the case reported in this paper a small hydronephrosis was found above the tumor. This was demonstrated by the pyelogram before operation.

METASTASES

It would appear that metastases occur in these cases as frequently as in any other form of carcinoma. In 3 cases bone metastases were stated to be present: lumbar vertebra (Adler), ilium (Hektoen), spine (Schmitt). The following distribution has been reported:

[1] H. L. Kretschmer. Surg., Gynec. & Obst., 1920, Oct.: Arch. Surg., 1922, v.

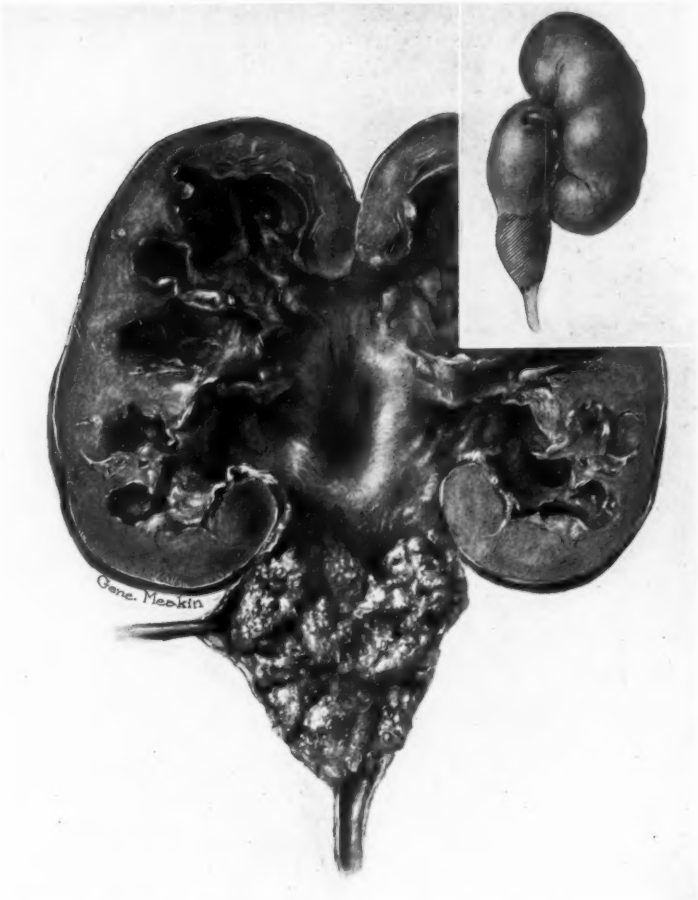

Fig. 2. Papillary carcinoma of the ureter with hydronephrosis.

Liver and lymph glands	Davy
Right lung and bladder	Gerstein
Liver, lungs, and lymph glands	Rundle
Liver, left kidney, and spine	Schmitt
Liver, lung, and lymph glands (2)	Voelcker and Vorpahl
Right kidney	Israel
Nerves	Kidd

It is interesting to note that in 5 of the 8 cases there were metastases in the liver, which appears to be more frequently the seat of metastases than any other organ.

LOCATION IN THE URETER

A study of these 35 cases shows that carcinoma occurs more frequently in the lower portion of the ureter, since in 19 cases it was found at varying parts in the lower third. In 2 cases it was stated that the tumor was situated in the middle of the ureter and in the remaining 8 cases the upper ureter was involved. The entire ureter, or practically the entire ureter, was involved in 6 cases.

SYMPTOMS

Hæmaturia heads the list of symptoms because it is the most constant symptom, having been present in 24 of the 35 cases. In some of the remaining cases no mention is made of bloody urine. This probably does

not represent accurately the exact status regarding the occurrence of hæmaturia, in view of the fact that some of the cases, being autopsy cases, received only brief mention. In several cases definite statements were made that blood in the urine was absent (Adler, Von Capellen, Hektoen, Toupet and Gueniot, Wising and Blix). Pain was a most important and constant symptom, being present in 26 of the 35 cases. There was nothing characteristic about this pain from which a diagnosis of carcinoma of the ureter could be made or surmised, nor was it always referred to the same place. In 21 cases pain was the first symptom noted, and was most frequently referred to the back on the corresponding side on which the tumor was found. The most frequent terms used by the authors in describing the location of the pain were, lumbar region, region of the kidney, in the back, and in the abdomen. In 5 cases the pain was referred to the hip (Hektoen, Gerstein, Spiess, St. Thomas Hospital, and Kidd). In some of the cases the pain was due no doubt to the hydronephrosis.

DIAGNOSIS

The diagnosis from the history and physical examination is almost impossible, especially when the tumor is small, but when it reaches a large size so that it can be felt by abdominal palpation, the diagnosis can be made or surmised. In women it is possible to palpate the tumor through the vagina and in men carcinoma of the lower ureter may be felt through the rectum. In order to make an accurate diagnosis, it will be necessary to resort to the use of special diagnostic aids, such as cystoscopy, ureteral catheterization, and pyelography. In cases in which the tumor protrudes from the ureteral orifice, the diagnosis can be made by the cystoscope or a diagnosis may be ventured when there is profuse hæmorrhage from the ureter associated with obstruction, as demonstrated with the ureteral catheter, assuming, of course, that stone and stricutre have been excluded. But we must not forget that both stone and carcinoma may occur at the same time. Persistent bleeding from the ureter after nephrectomy is highly suggestive of ureteral neoplasm. In a recent letter from Dr. Collester he informed me that the patient, whose case is here reported, has again passed blood in the urine. This probably means that the patient has recurrence of tumor formation in the stump of the ureter.

In view of the fact that hydronephrosis is so frequently found, pyelograms may give some additional information. The present literature contains nothing in the way of pyelographic data since most of the cases were published before pyelograms became part of our routine examination.

A pre-operative diagnosis of carcinoma or tumor of the ureter was made by Albarran, Chevasse and Mock, Gerstein, Judd and Struthers, Rathbun, Richter and Zironi. The following is a list of some of the pre-operative diagnoses made: sarcoma of the ilium (Butler); pyonephrosis (von Capellen); bladder papilloma (Finisterer); ureter calculus (Metcalf and Safford); carcinoma of kidney (Rundle); rheumatism and dementia præcox (Spiess); papilloma of the kidney with secondary involvement of ureter (Kidd).

A diagnosis of tumor of the kidney with hydronephrosis was made in the case reported here. This was based upon the age of the patient, slight loss of weight, a persistent painless unilateral renal hæmaturia, the pyelogram and the fact that pure blood was obtained from the ureteral catheter at the end of catheterization.

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SOME RARE ANOMALIES OF THE KIDNEY AND URETER WITH CASE REPORTS

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ANOMALIES of the kidney and ureter of one kind or another are of rather frequent occurrence. The most common types are unilateral duplication—partial or complete—horseshoe kidney and ectopic kidney on one side. Therefore, only extremely rare congenital defects are herein reported and cases of the above mentioned fairly common types are purposely omitted with one exception: namely, a unilateral bifurcated ureter with a mechanically perverse filling defect, Case 5. Of the 11 cases, 10 are congenital defects and 1 (Case 6) acquired. The first 6 described are all alive and in the remaining 5 the anomaly was discovered at necropsy.

CASE 1. A. H., age 32, war veteran, under care at Public Health Service, Veterans' Bureau at Los Angeles (Hosp. No. 552756). Patient's chief complaint is bronchial asthma of 7 years' duration; temperature range, 97.4 to 99.3 degrees. He has nycturia which is worse at times, and the frequent getting up at night aggravates his asthma. Urinalysis discloses some pus. He was referred to Dr. Joe Zeiler for urologic study. He has slight stricture in bulb.

Cystoscopy discloses only one ureteral meatus, and this is situated at the normal site on the right. This was catheterized and pyelo-ureterograms made. The ureter shadow ascends in a curve to the sacroiliac junction and crosses to the left, with the calyces facing to the right just as if the kidney had been normally placed on the right instead of on the left just above the iliac crest (Fig. 1). Patient was referred to me by Doctor Zeiler to check the findings and for advice as to treatment. Cystoscopic examination verified Doctor Zeiler's findings of only one ureter. His urethra was explored with a McCarthy instrument. No ureteral orifice was found in the posterior urethra. A No. 10 flute tip catheter was passed with this instrument through the ureter into the kidney pelvis. Indigocarmine injected intravenously appeared through the ureter catheter promptly, and no dye escaped around the catheter into the bladder.

The McCarthy cysto-urethroscope was left in and constant observation made for dye coming from a concealed ureter opening, both in the bladder and posterior urethra, for a 25 minute period. Not the slightest dye appeared except through the ureteral catheter. A pyelo-ureterogram was made with the catheter in the kidney pelvis and another by injecting with considerable force and withdrawing the catheter simultaneously until its tip was in the extreme lower ureter. No bifurcation was observed. Patient has a slight hernia on the left side and an ectopic testis in the left inguinal canal. His twin brother died at 3 years of age, cause of death unknown to him.

Horand (1) reported a case of this kind and, according to Garceau (2), the only one in the literature.

CASE 2. K. M., age 21, student, entered Los Angeles County Hospital, January 5, 1922 (Hosp. No. 168151). Patient slipped from the running board of an automobile about 1 month ago, and suffered severe lumbar pain a few hours afterward. His urine contained blood, but no pus at first. A few days later, he had definite pyuria. Cystoscopy disclosed no left ureter opening in the bladder. There was an oval opening in left side of urethra near the colliculus. Catheterized specimen from this side was creamy with pus. Uretero-pyelogram (Fig. 2) showed immense dilatation and sacculation of both the ureter and kidney. Patient was moderately ill, but not bedridden. He denies gonorrhœa;

no previous history of urinary disease or urinary symptoms, dribbling or incontinence. Mother had harelip. History otherwise irrelevant.

January 14, 1922, nephro-ureterectomy. An infected hydronephrotic sac and hydro-ureter holding 350 cubic centimeters were found. The terminal portion of ureter was too fibrous, rigid, and adherent to be removed. Convalescence was uneventful.

March 1, 1922, 2 glass test: first glass quite clear; second glass markedly purulent. The stump of ureter was catheterized, the fluid drained off, injected with sodium bromide, and picture taken (Fig. 3). Repeated the procedure of catheterizing, lavaging, and draining on 3 subsequent occasions, but sac refilled with urine each time and sinuses in the middle of each incision above gave no evidence of healing.

March 13, 1922, re-admitted to the hospital. Young perineal exposure made after previous insertion of an ureteral catheter into the stump through a cysto-urethroscope. It was impossible to remove the sac, but it was opened accidentally. The terminal portion of the ureter, coursing through the base of the left lobe of the prostate, was not dilated and was dissected out, a ligature thrown around it, the catheter withdrawn, ligated near the urethra, and cut off. The sac was drained by a cigarette drain. All wounds healed speedily and the patient left the hospital in 17 days. He has been in good health since.

A careful search of American and foreign literature reveals 20 cases of ectopic opening of the ureter in the male posterior urethra and 11 in the male genital tract. Twenty-nine were discovered at necropsy. The cases of Chute (3) and Albarran (4) were discovered in the course of operation.

Cases of solitary dystopic kidney situated in the true pelvis are extremely rare. Cullen (5) reports a case. Judd and Harrington (6), in an article on ectopic kidney, in reporting 17 cases of ectopic or pelvic kidney, report a single case of this character, the only one observed at the Mayo Clinic up to that time. Polk (5), of New York, operated on a case of this character in 1882. The mass in the pelvis was removed and it proved to be a right pelvic kidney. The patient lived 13 days and at autopsy Welch found this to be the only kidney. Strube (7) reports a case: "Male infant. Aged 4 weeks. No left kidney or ureter. Right kidney low down in true pelvis, entirely filling its cavity; it was of irregular shape, adapted to the concavity of the sacrum. Single ureter on right side of bladder. 3 renal arteries." No other case reports could be found in the literature available.

CASE 3. Mrs. J. R., age 20, Mexican, entered Los Angeles County Hospital, July 29, 1921 (Hosp. No. 162076). Patient complained of pain in the right iliac region, which lasts from 4 to 7 days once a month. She has never menstruated. She has headache of severe type, coincident with pelvic pain. Otherwise she has never been ill. Pain began when she was 15 years old. She has been married 4 years. Pain has been more severe since she has been married.

Physical examination and examination of external genitalia are negative. Bimanual examination reveals an apparent absence of the uterus and adnexa. She has right inguinal hernia. Secondary sexual characteristics are well marked. The vagina is short, length 7 centimeters, and ends in a vault with cervix. Dyspermasia is very slight. She was advised to have operation for relief of pain in right lower quadrant. It was explained to her that it would not alter her amenorrhœa. The above notes were made by Dr. Phil Boller, who operated on her, August 1, 1921, and who has kindly furnished the operative data as follows: "Operation: (1) nephrotomy, (2) appendectomy, (3) right inguinal herniotomy. The abdomen was opened by a median suprapubic laparotomy incision. A rudimentary tube was found on the right side, its origin lost in the peritoneum on the lateral pelvic wall. Located in the center of the pelvic cavity was a mass which resembled, very markedly, a slightly enlarged and congested uterus, except that the peritoneal covering was rather loose. An incision was made into the cavity of the supposed uterus and then it became evident that the mass was a kidney with the hilus located posteriorly. The nephrotomy incision was closed and exploration made of the upper belly. No other kidney existed. There may have been present, in some of the peritoneal folds of the pelvis, some rudimentary structure which may have been an ovary; this could not be determined with accuracy. The operative work was completed without drainage. The patient made an uneventful recovery." Following convalescence, patient referred by Doctor Boller to Urological Department for check.

August 20, 1921. Cystoscopy disclosed one ureter opening on the left side near the midline of the bladder. Cysto-urethroscopy disclosed no opening in the urethra or bladder. There was no clinical history of incontinence or dribbling. Intravenous injection of indigocarmin was followed by no dye except a slight leakage around the catheter in the ureteral meatus which could be plainly seen. Pyelo-ureterogram (Fig. 4) was made of this kidney. The marginal outline is necessarily not distinct by reason of the shadow being directly over and blending with bone tissue, namely, the sacrum, coccyx, and ilium at the sacro-iliac joint.

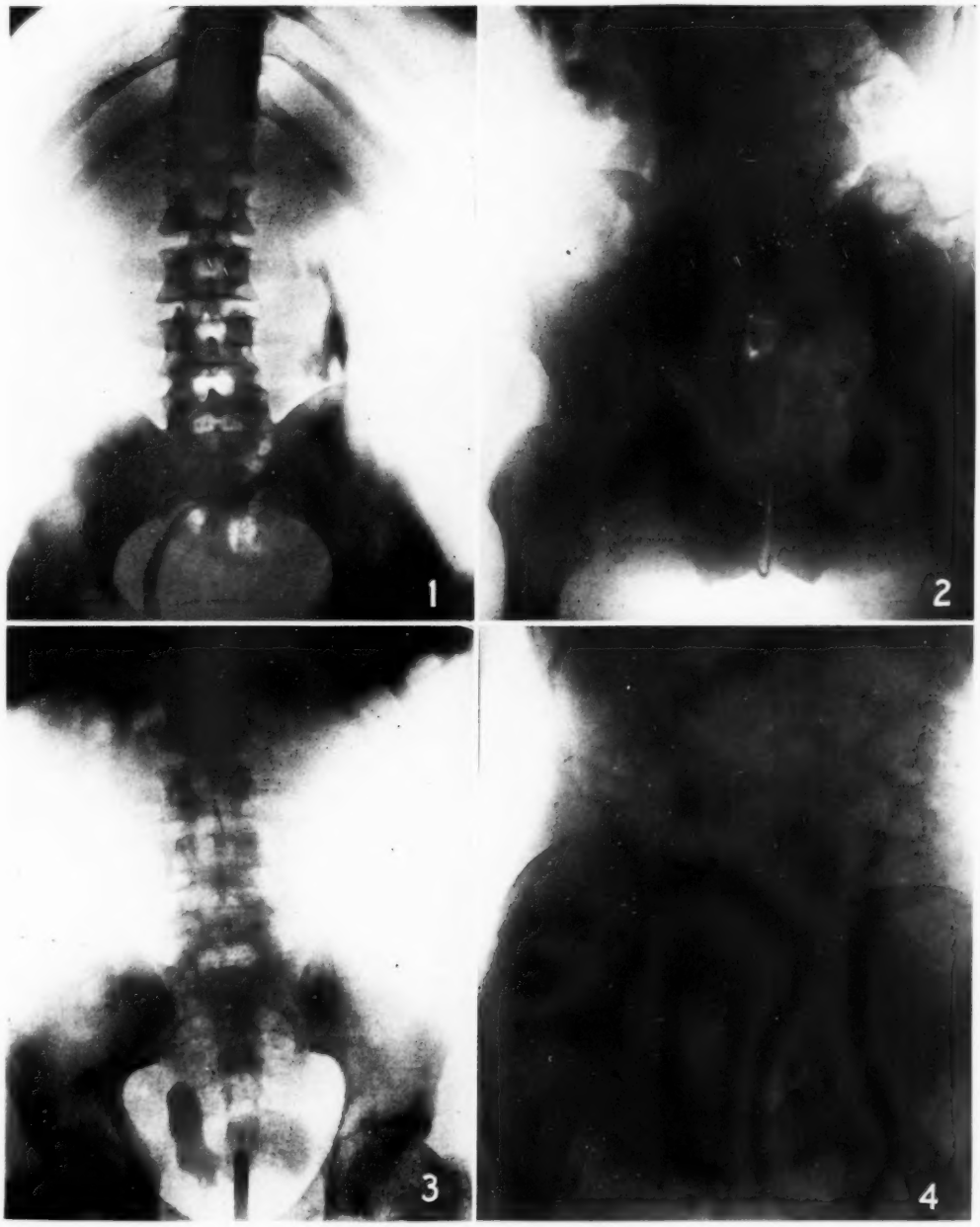

Fig. 1. Congenital single kidney with crossed ureter. Case 1.

Fig. 2. Infected hydronephrosis and hydro-ureter with ureter opening into posterior urethra. Case 2.

Fig. 3. Closed sac formed by stump of ureter after nephro-ureterectomy. Case 2.

Fig. 4. Single dystopic kidney; outline of single ureter good; of kidney pelvis obscured by bone. Case 3.

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 5. Complete bilateral duplication. Case 4.
Fig. 6. Bifurcation left ureter opposite fourth lumbar; catheter enters upper pelvis; fluid regurgitates into lower pelvis, leaving upper empty. Case 5.

Fig. 7. Pocketed multiple bird-seed calculi; resembles 5 large calculi; pressure necrosis and separation of ureter from kidney pelvis. Case 6.

CASE 4. Mrs. R. N., age 27, minister's wife, referred by Dr. George Thomason. Patient consulted me July 7, 1922. She has one child 18 months old. While pregnant, routine examination showed pus and albumin in urine repeatedly. Considerable frequency from fifth month of pregnancy to present time. Present complaint: frequency of urination. Urine contains microscopic pus and Gram negative bacilli; also a trace of albumin. Cystoscopy disclosed 2 ureter openings on each side at about the normal sites. All 4 ureters catheterized simultaneously at second visit after previous combined phenolsulphonephthalein and blood chemistry. Phenolsulplonephthalein from right ureters 1.7 and 2 per cent respectively; left 19 and 6 per cent respectively. Microscopic pus from both catheters on the right; none from either left ureter. Multiple pyelograms made (Fig. 5) show complete bilateral duplication. Pus and albumin in the bladder urine and frequency of urination disappeared very soon after ureteral catheterization.

Mertz (8), Harpster (9), and Braasch (10) have each reviewed the literature very admirably. Approximately 86 cases of bilateral duplication—partial or complete—have been recorded in the literature, combining clinical and autopsy cases. Nine of these have been discovered at the Mayo Clinic, 8 complete and 1 partial. Of these 86 cases, 48 were complete bilateral duplications of the ureter, with 11 more cases of complete bilateral duplication, with one ureter ending blindly or having an ectopic orifice.

No doubt, these anomalies often predispose to infection for mechanical reasons affecting drainage. In the author's case, the symptoms were mild and the patient had never consulted a physician regarding any urinary disturbances. History and urinalysis preceding a proposed tonsillectomy caused her to be referred for urological investigation.

CASE 5. D. M., age 33, referred by Dr. E. C. Moore, April 26, 1920. Patient developed urethral discharge while in overseas service 1 year ago. Mild in character, but rather profuse from onset. Had been continuously in government hospitals in France, and in Arizona and California for 11 months. He gave history of some pain in left flank at times; had never been cystoscoped. Urethral smear showed no gonococci. Two glass test: both glasses creamy. No residual urine. Prostatic juice after massage: 90 per cent pus. Catheterized specimen: reaction acid, trace of albumin, pus and Gram negative bacilli.

April 27, 1920, catheterized both ureters easily. Pus and bacilli came from left; occasional bacillus but no pus from right. Pyelograms were made (Fig. 6). In this picture, the ureter catheter on the left side seems to have punctured the ureter on its mesial aspect opposite the fourth lumbar vertebra. I knew this could not be, since urine free from gross blood dripped from this catheter and there had been

excreted 12 per cent of phenolsuphonephthalein in 20 minutes from that side.

Patient sent to California-Lutheran Hospital (Hosp. No. 59247) for rest and treatment.

May 1, 1920, left ureter catheterized with No. 11 Garceau and pyelo-ureterogram taken. Picture showed bifurcation of left ureter opposite fourth lumbar vertebra with upper and lower pelves well injected. The bizarre feature was that the catheter, well placed within the upper pelvis, failed to inject it but did inject the lower pelvis and its ureter as far down as the bifurcation. The urethral discharge diminished very markedly after the first urethral catheterization, but there was very little further improvement despite the usual treatment plus repeated kidney lavage and ureteral dilatation up to the time, a few weeks later, when he re-entered a government hospital.

CASE 6. Miss B. H., age 34, referred by Drs. Roland Cummings and F. M. Pottenger, March 21, 1921. Patient had had mild pulmonary tuberculosis 8 years ago, with no activity of disease for years. She gives a history of mild obscure abdominal disorder for past 3 or 4 years. During this time she complained of bloating, gas, and slight mucous colitis. She had no pain or fever until one week ago. The pain started in the back, but after a few hours manifested itself entirely in the front. Examination at that time by Doctor Cummings showed a mass in the left kidney region, fluctuant, and only slightly tender, temperature 103 degrees. Swelling gradually subsided and 6 days after onset of attack, no mass could be palpated. Temperature now 98.8 degrees. Urine shows faint trace of albumin, small sediment, few pus cells, many short-chain streptococci and some staphylococci. Cystoscopy showed urine from right kidney negative; left—no drip, no phenolsulphonephthalein, no leakage of phenolsulphonephthalein into the bladder. The ureter was injected for pyelogram (Fig. 7), but failed to ascend above the fifth lumbar vertebra. This was repeated later and stereopyelo-ureterograms showed the upper end of the ureter curving abruptly forward as though the end was distinctly against or near the parietal peritoneum of the abdominal wall.

There seemed to be a closed hydronephrosis with multiple calculi. It did not seem possible, however, that a kidney with calculi over such an area as shown in the picture, extending from above the twelfth rib to one inch below the crest of the ilium, could escape palpation. Stereoroentgenograms following barium enema showed the shadows behind the barium. Indigocarmine injected intravenously did not appear in the vagina vestibule or colon flushings. The possibility of a left ureter with congenital absence of the left kidney was considered. This must be extremely rare, but does occur (vide Case 10 in this report).

On March 31, 1921, left nephrectomy was performed at California-Lutheran Hospital (Hosp. No. 63559). An elongated sac containing about 300 cubic centimeters of fluid, but not dense, antero-internal to a long flattened kidney shaped like a calf's tongue, was easily removed with the kidney. It had a long pedicle, no adhesions and no forceful finger dissection was necessary. The renal vessels came off extremely high and quite a way from the lower pelvo-ureteral junction. Notwithstanding this, the ureter was never encountered or seen during the operation. Specimen examined by Dr. A. H. Zeiler with following report:

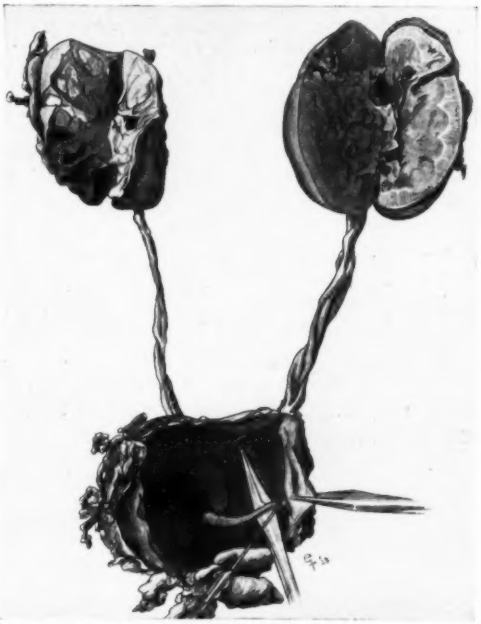

Fig. 8. Congenital loop apparently making the 2 ureters continuous. Lumen on left to mid line of bladder. Case 7.

"Kidney is elongated to 14.5 centimeters in length. The hilum is hollowed out and occupied by a greatly dilated pelvis. This is triangular, each side of the triangle measuring 9 centimeters after fixation. The ureter is not present—there is a tiny opening at the apex of the triangle which may represent the opening into the ureter. Section shows that the kidney substance is thinned out—usually less than 1 centimeter thick. The pelvis contains a great mass of tiny calculi which are brown, usually oval, averaging 3 by 1.5 millimeters. The mucosa of the pelvis is granular. . . ."

The X-ray shadows were caused by an enormous number of tiny calculi, exactly resembling bird-seed in size, shape, and color. One thousand of them weighed 6.54 grams. There must have been 10,000 of them altogether as will be readily imagined from their small size and the enormous shadows seen in

the illustration. Chemically, they consisted of calcium and magnesium carbonates and pigment.

Patient relieved in due time of her former symptoms, gained 20 pounds in weight, and feels entirely well at the present time.

A possible explanation of the mechanical factor in this case is this: stenosis of the pelvo-ureteral junction, back-pressure, hydronephrosis, sudden complete obstruction, great distention of the renal pelvis therefrom, distortion and angulation at pelvo-ureteral junction as suggested by stereoscopic ureterogram and the distended kidney pelvis appearing more or less anterior and ahead of the kidney as delivered through the wound, and as a final result pressure necrosis at the angulated point with separation and retraction of the ureter downward toward the bladder.

CASE 7. P. W., age 21, consulted me in the office, January 15, 1923. Patient complained of frequent urination, gas in stomach, loss of weight and appetite, and swelling of the left testicle. First consulted physician 5 years ago for hæmaturia. Since then he has been gradually getting worse, with frequent intermissions of improvement. The urine is very cloudy. Residual urine 380 cubic centimeters. To remove this required frequent suction of syringe by reason of its thick, tenacious, mucinous character. A diverticulum was suspected and a cystogram made—negative for diverticula. Numerous tubercle bacilli were found in the urine. Blood chemistry: non-protein nitrogen 150 milligrams; creatinin 3.7 milligrams. He was referred to Los Angeles County Hospital (Hosp. No. 184212) with request that he be treated as a prostatic and drained by catheter for requisite period before any cystoscopic procedure. Died January 22, 1923. Abstract from necropsy findings:

"In addition to bilateral pulmonary tuberculosis, tuberculous pleurisy, tuberculosis of the ileum and ascending colon, and miliary tuberculosis of the bladder, there was complete destruction of the right kidney—tuberculosis—with occlusion of the right ureter over a distance of several centimeters—autonephrectomy on the right side. There was advanced tuberculosis of the left kidney with a dilated tuberculous ureter."

The left ureter did not terminate in a meatus as it pierced the bladder wall, but extended directly through the bladder wall, made a loop across the trigone and became adherent through a thick, fibrous cord to the right of the trigone extending to the internal lip of the right ureteral meatus (Fig. 8). There was a meatus on the external surface of this tube about 1 centimeter from the point where it (the left ureter) pierced the bladder (Fig. 8). The pathologist states one could easily insert a finger under this loop before it was severed. The lumen of this tube extended fully to the midline of the bladder and gave the appearance of having been patent all the way across to the right and continuous with the right ureter but obliterated by the tuberculous process, just as the middle portion of the right ureter had been obliterated. A similar case in the literature available could not be discovered.

Congenital single kidney normally placed with normal ureter is considerably more rare than horseshoe or fused kidney. Ballowitz (11) reviewed 213 cases of congenital absence of one kidney from the literature. The corresponding ureteric orifice was absent in all but 15. When a ureter is present on the side where the kidney is absent, it is usually short and rudimentary and very rarely occurs. Absence of one kidney is often accompanied by some malformation in the genitals.

CASE 8 W. B., age 66, club servant, complains of nycturia, and believes he has prostatism. Two glass test: glass 1 clear; glass 2 contains trace of blood but no pus. Residual urine 1 ounce. The prostate is quite large by rectal palpation and cystoscopy. The bladder is trabeculated. Both ureteral meati appear normal. He presented a large, symptomless, but easily palpable right kidney and with blood in his urine I suspected neoplasm. I catheterized right ureter easily, but every size and shape of catheter would enter left side only about 4 millimeters. It was thought a catheter could be passed at a later date, as often happens. Since he had a perfect meatus on this side, absence of one kidney was not considered. Functional test was not done, inasmuch as only one side could be catheterized at that time. A pyelogram on the right side was made, however, to discover if the large kidney was neoplastic. The pyelogram was normal. Seven weeks later he contracted influenza, was sent to the Los Angeles County Hospital, and died there from broncho-pneumonia December 29, 1919 (Hosp. No. 141449).

Necropsy disclosed complete absence of the left kidney and ureter with a very large infected, but otherwise normal, right kidney normally placed.

CASE 9. A. A., age 30, admitted to Los Angeles County Hospital October 9, 1919 (Hosp. No. 139410). On medical side until his death, November 9, 1919.

Clinical findings of organic spinal cord disease. His urinary infection was attributed to cord lesion and urologists not consulted.

Necropsy findings: pulmonary tuberculosis, tumor of spinal cord opposite the eighth dorsal vertebra, small tumor (nodular) in right adrenal; tuberculosis of right kidney and bladder; congenital absence of the left kidney and ureter, and no ureteral meatus present in the bladder on the left side.

CASE 10. (Personal communication from Dr. Glanville Rusk, Professor of Pathology, University

of California). "Male, age 34, died March 6, 1922. Uræmic symptoms appeared one week after contracting influenza. Necropsy findings (A/22/32 of series): right kidney apparently absent; small well developed normally patent ureter on this side, extending from the bladder to the right renal fossa where it ended abruptly in a thin solid fibrous cord. This condition was later verified by a roentgenograph taken after injecting the ureter with opaque substance (sodium bromide). In this it was seen that the injected material ended sharply at the kidney region, without showing the least trace of a renal pelvis. Subsequent sections from the right ureter showed a widely patent tubular structure with a three-layered wall identified microscopically as ureter. The tissues about the right renal fossa, together with the right ureter, were removed *en bloc* and multiple sections taken serially from the region included between the distal closed end of the right ureter and the right adrenal. Microscopic examination of these sections showed fibrous and fatty tissue, striated muscle, nerve and ganglia, but no sign of renal tissue. Investigation of the large blood vessels disclosed a normal renal artery on the left, but only a small blind outpocketing from the aorta in the region of the renal artery on the right."

CASE 11. E. B., male, age 7, admitted to Los Angeles County Hospital, April 30, 1923 (Hosp. No. 189306). Child was well until 2 months ago, at which time he developed a non-productive cough, pain in chest, nausea and vomiting, swelling of ankles, and difficulty in breathing. Death occurred the day following admission to the hospital.

Necropsy findings: 1. Congenital absence of right kidney and right adrenal.

2. Left kidney had 2 separate pelves, each with a separate ureter. The ureters run parallel to each other as far down as the fifth lumbar vertebra, where the one draining the cephalic pelvis turns obtusely to right and enters the bladder at the normal position on right and ureter draining caudal pelvis enters bladder at normal position on left.

3. Examination of the single kidney disclosed diffuse subacute nephritis. Marked hypertrophy of heart, but no valvular lesion ascites, hydrothorax and hydropericardium were present.

Here, then, we have congenital absence of one kidney in 4 individuals of 4 distinct types, namely:

Case 8, normal ureteral meatus, but no ureter on side with no kidney;

Case 9, no ureter or ureteral meatus on anomalous side;

Case 10, ureter extending to near normal kidney position, but no kidney tissue in or around this area nor any evidence of renal vessels;

Case 11, single kidney normally placed with complete duplication of pelvis and ureter, in which cystoscopically the right and left ureteral meati would appear normally placed in the bladder.

With Cases 1 and 3 added, we have 6 distinct types of congenital solitary kidney.

The obvious lesson from the clinical study of individuals with congenital defects of the urinary tract is to take advantage of every accessory method of examination and investigation when the routine standard procedures leave certain findings otherwise unaccounted for.

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OSTEOCHONDRITIS DEFORMANS JUVENALIS[1]

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LEGG (15), in 1910, under the title "An Obscure Affection of the Hip-Joint," called the attention of the profession to a condition in the hip which had theretofore been diagnosed as tuberculosis, but which he believed to be a separate disease entity. He described the symptoms and roentgen-ray findings of the condition, which has since been designated as osteochondritis deformans juvenalis, but offered no theory as to its etiology except that trauma, direct or indirect, might be a factor. He summarized his findings in a general way as follows:

1. Age: five to eight years;
2. History of injury;
3. Limp;
4. Thickening about the neck of the femur;
5. Absence of pain;
6. Absence of constitutional symptoms;
7. Little or no spasm;
8. Absence of shortening—

and causative queries as follows:

1. Is this condition the result of congenital deformity or faulty development?
2. Is it the result of a constitutional disease?
3. Is it the result of direct injury?
4. Is it indirectly due to injury?

The writer has reviewed the literature on the subject with the hope that an answer might be found to one of the above questions, or that one of the various etiological theories so far advanced might be established on a firmer foundation.

REVIEW OF THE LITERATURE

The older books on diseases of the joints bear evidence that osteochondritis deformans juvenalis existed in the past. Brodie (4), in 1842, in writing of tuberculosis of the joints, said that if it received very early attention, the function of the joint might be wholly unimpaired. The cases on which he based this statement undoubtedly were of osteochondritis deformans, since it is known that tuberculous coxitis always causes some permanent destruction of the joint. Had the condition of osteochondritis deformans juvenalis been recognized earlier, fewer cases would have been reported as cured of tuberculous coxitis, with return of normal function, by certain methods of treatment or by a special form of brace.

Shortly after the publication of Legg's original article, there appeared a paper by Perthes (18), in which he presented clinical and roentgenological findings identical with those described by Legg, but Perthes, at that time, considered the condition to be a deforming arthritis of the juvenile type.

In 1913, a second article by Perthes (19) was published, in which he gave to the condition the name of osteochondritis deformans juvenalis and refuted his original idea that it was a form of juvenile arthritis. He gave a detail of the symptoms of the disease similar to Legg's in 1910. He could not agree that the condition was in any way related to arthritis or tuberculosis. He observed in his cases that in spite of improvement in mobility in the joint, roentgen-ray examinations showed steady increase in the size of the femoral head, ending in the mushroom deformity observed by all writers. In the one instance in which he operated, he described the macroscopical and microscopical findings in detail, and asserted that no evidence of infection was found. The entire picture did not in any way coincide with the changes found in arthritis deformans, and he concluded that the two diseases were in no way related. He agreed with Legg as to the findings and symptomatology of the condition, but did not advance any theory of etiology except that trauma was worthy of consideration, although he did not find it present in all his cases. He asserted that the material at the Tuebingen Clinic had nothing to offer in support of the theory of mild osteomyelitic infection in early childhood as an etiological factor.

[1] Read before the Riverside County Medical Society, Riverside, California, April 9, 1923.

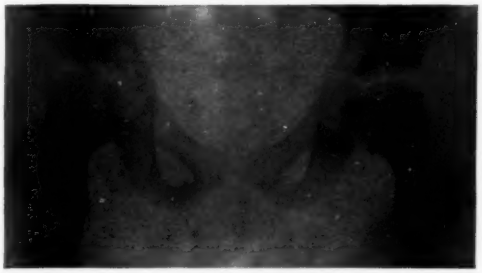

Fig. 1. Case 1. June, 1914. Roentgenogram taken at the time of the patient's first trauma, showing no change in the hip joints.

Fig. 2. Case 1. October, 1916. Fourteen months after the original trauma, showing changes in bone characteristic of osteochondritis deformans juvenalis.

These papers by Legg and Perthes were undoubtedly the first to contain accurate descriptions of osteochonditis deformans juvenalis, but Freiberg (8), in 1905, described two cases under the designation of arthritis deformans coxæ juvenalis, the chief clinical interest of which lay in the impossibility, at that time, of distinguishing them from adolescent coxa vara without the aid of the roentgenogram. Thus, much earlier than their European confrères, did the American profession differentiate the condition from tuberculous coxitis.

Brandes (2), in 1914, carefully reviewed the literature and reported ten cases, giving histories and roentgenographic findings. He differentiated the condition from arthritis deformans, showing that the two diseases were separate entities. He inclined to the belief that some derangement in the region or vicinity of the synarthrosis of the epiphysis was an etiological factor, and that trauma played no small part in the production of the disease, causing some disturbance of the arterial supply about the epiphysis which in turn caused the symptoms. He mentioned cases of his own, and cited statements of other observers, confirming the occurrence of the disease in persons of the same family, which suggested an hereditary influence.

In two of Brandes' cases, some doubt might be cast on the diagnosis. In Case 1, there was a positive reaction to tuberculin, the presence of meningismus, and, later in the course of the disease, night cries and the demonstration in the roentgenogram of the presence of rarefaction of the femoral head. These symptoms do not appear in the cases reported by most observers. In Case 6, a history of tuberculosis in the family, and the presence of creaking in the joint on flexion, are rather in contradiction to the observations of other men, who make a point of distinction between the absence of creaking in osteochondritis deformans juvenalis and its presence in arthritis of the juvenile type.

Brandes (3), in 1920, gave an account of the end-results of the ten cases reported in 1914. As a result of his study, he made three points of observation:

1. Osteochondritis deformans may appear as a secondary malformation after congenital luxation of the hip;

2. It may be hereditary, appearing in children of the same family, or in families where congenital luxation of the hip is found;

3. The disease is not infrequently bilateral.

These observations have not been confirmed by any other writer except that many observers have found that the disease may appear after reduction of a luxated hip, which Legg considers a confirmation of his theory of trauma.

Delitalia (6), in 1915, gave a complete résumé of the disease in all its aspects. He cited one case where the disease occurred in members of the same family, and mentioned other writers who had observed the familial type. He reported one case where trauma was apparently the etiological factor, did not observe any cases in which tuberculosis appeared to be the etiological factor, and noted the preponderance of the occurrence of the condition in the male. In speaking of the

Fig. 3. Case 1. March, 1917. Some improvement in bone condition.

Fig. 4. Case 1. June, 1922. Five years after the original trauma, showing typical mushroom deformity. The patient has perfect function, no limp, and no shortening.

similarity of coxa vara and osteochondritis deformans, he said:

"In both conditions the essential of the process is a disturbance and partial arrest of the cartilage ossification. In the coxa vara there predominates an atrophy of the lower medial part of the neck, in Perthes' disease at the exterior upper part; but while in the first only the cartilage is affected and the cephalic nucleus, which has appeared in the third month of life, continues to develop normally, in the second there is also a trophic process causing it to develop in an irregular and incomplete manner. And since the alterations which are remarked in coxa vara correspond to the territory of one of the three terminal arteries which, according to the studies of Lexer serve the nutrition to the upper end of the femur, and since in Perthes' disease these correspond to the territory of the other two arteries, one can think that the same disease cause, acting now in one part and then in another, has produced the two different clinical entities. In the one case the deficiency of osseous trabeculæ at the interior part of the femoral neck, which form an important part of the pressure lines, allows the epiphysis to curve toward the lower part. In the other the incomplete ossification of the medium and upper part of the neck, weakening the mechanical traction lines, allows the epiphysis to lodge there and become crushed.

"What the reasons are for this derangement of growing cartilage in the cephalic nucleus, it is not possible to ascertain. We may exclude, due to the anatomopathological observations

Fig. 5. Case 2. June, 1921. Moth-eaten appearance of the epiphysis, which is so typical at the onset of the disease. Contrast with Figure 7.

Fig. 6. Case 2. July, 1921. Moth-eaten appearance of the epiphysis less marked, and beginning mushroom deformity.

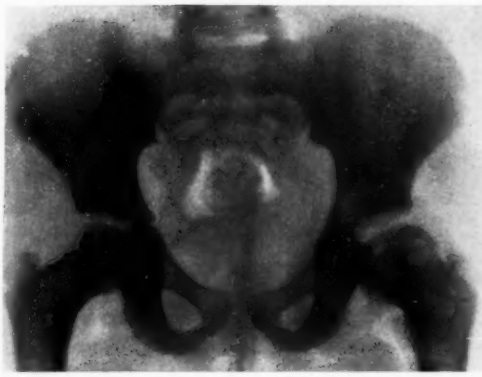

Fig. 7. Case 2. March, 1922. The moth-eaten appearance of the epiphysis (see Figure 5) has disappeared, and the characteristic mushroom deformity is well-marked.

Fig. 8. Case 2. September, 1922. Enlarged femoral head, mushroom deformity, and short femoral neck.

made, all infectious processes, traumatic causes, rickets, and we finally must resort to a very early disturbance, probably congenital, of the epiphyseal organ of growth."

Although from this observation he rules out traumatic causes, it would appear that his line of reasoning in support of the theory of congenital or early disturbance of epiphyseal organ of growth is identical to that of Legg in support of the theory of trauma, which will be given later in this paper.

Delitalia summarizes his observations as follows: "One can say that the disease makes its appearance during periods of full and general good health; in people not affected by tuberculosis, syphilis or any other infectious disease; at an age ranging from 4 to 11 years; mostly prevalent in the male sex, on one side only."

Taylor and Frieder (22), in 1915, reported their observations in nineteen cases. Their conclusions were as follows:

"1. Quiet hip disease, osteochondritis of the hip, or Perthes' disease, is not tuberculous or syphilitic, but a distinct morbid entity with characteristic symptoms, roentgenograms, course and termination.

"2. It is benign and fairly common.

"3. Simple treatment only is needed, and the prognosis is good.

"4. Its inclusion with tuberculosis of the hip falsifies statistics and leads to errors in prognosis and treatment.

"5. It is one cause of adult osteo-arthritis of the hip."

Four of their cases gave histories of trauma, but in view of the fact that it had occurred so long before, they did not support the theory of trauma. They did not, however, advance any definite theory of etiology.

Allison and Moody (1), in 1915, reported in detail eight cases of this disease; also three cases of similar changes occurring in the shoulder, radius, and tibia, which they considered not unlike those occurring with osteochondritis deformans. Their observations led them to the following conclusions: "We are inclined to believe, from the foregoing, that osteochondritis deformans juvenalis is a disturbance of the line of epiphyseal growth, and that it depends for its typical development upon changes in circulation which destroy the nice balance which exists between metaphysis and epiphysis in growing bones."

In order to determine the influence of slight injury on the epiphysis, they performed six experiments on rabbits; in all these the results were negative for production of the disease, although in only two cases were the observations made after a period of 5 weeks, which might account for the negative results.

Freiberg (9), in 1916, reported two cases of osteochondritis deformans coxæ juvenalis, and mentioned the fact that in 1905 (8) he described two cases under the designation of arthritis deformans coxæ juvenalis. In this

Fig. 9. Case 3. March, 1921. Typical mushroom deformity and shortening of the femoral neck.

Fig. 10. Case 3. May, 1922. Same Case as Figure 9, 13 months later, showing decided improvement.

paper he did not associate the disease with trauma; he believed that the condition was the result of an infectious process, perhaps in the tonsils, and that in all cases thorough search should be made for foci of infection.

Legg (16), in 1916, in a most classical manner, brought forward his reasons for ascribing to trauma the rôle of causative agent in the production of this condition. He divided them into three classes:

1. Cases of known trauma;
2. Negative cases, or those in which no definite history of trauma could be made out;
3. Cases of operative trauma, following reduction of congenital luxation.

Of the etiology of the condition, he said: "I offered in 1909, therefore, the hypothesis of trauma as the first cause producing a disturbance in the circulatory relationship between the epiphysis and the neck of the femur, the immediate result being atrophy in the former, through a diminished blood supply, and hypertrophy in the latter. The hypertrophy seemed to me to be related to the hyperæmic condition induced, not only temporarily by traumatic congestion, but maintained for a considerable length of time by a proportionately increased blood supply where the blocking of the epiphyseal channels distributed a heavier circulation to the neighboring diaphyseal vessels. Adding to this disturbance the factors of pressure and growth, also through a definite period of time, my conclusion as to ultimate result was that pressure upon the epiphysis, atrophied by diminished blood supply, produced flattening; that growth, as especially stimulated in the hyperæmic upper diaphysis, produced thickening in the neck and modification in shape approximating the varus condition."

Up to that time, no one had laid a better foundation in support of a theory of the etiology of this condition. The reasoning and anatomical basis for Legg's belief cannot be overlooked. In this paper he suggested also that the disease be named osteochondral trophopathy, which he asserted was descriptive of the condition.

Kidner (14), in 1916, asserted that various authors had described the course, symptomatology, and treatment of this disease, but few had written anything about its etiology. He reported that in one case on which he operated, he found in a small necrotic area a staphylococcus aureus of low vitality. He, therefore, believed that the disease was due to a low grade hæmatogenous infection, and for this reason that the logical treatment to hasten recovery and limit destruction would be the clearing out of this focus. This theory of infection was based on one case only, and operation, which perhaps gave good results in the hands of a careful operator, such as he, seems rather a hazardous treatment to recommend to the average surgeon who might ignore the epiphysis and destroy too much, thereby stunting for all times the normal epiphyseal growth. Legg reported a similar finding in one case in which he operated, but he considered the infection to be coincident, rather than a causative factor in the production of the disease. Gibney (13), in 1917, mentioned Legg's contribution as the first information on this condition, and Perthes' article as the second. He described in detail several cases, but offered no theory of etiology.

Legg (17), in 1918, again advanced his reasons for the theory of trauma, and quoted several authors who substantiated his views. He gave reasons why he could not accept the theory of rachitic origin as advanced by Calvè, of congenital origin, by Delitalia, or of infectious origin, as supported by Kidner and Freiberg.

Francisco (10), in 1920, reported in detail two cases of the disease, in one of which there was a history of trauma. He believed that the condition could be ascribed to improper development, but offered no explanation for such improper development. In a later paper (11), published the same year, he still believed the condition to be the result of improper development of the head and neck of the femur, and that it might involve other lines. If, however, we accept this theory, we must find the causative agent which produces the faulty development, and since none has been advanced we can accept this theory only as a speculative one. Legg and the writer have each reported a case in which roentgen-ray examinations have shown first a normal hip, and later the typical changes observed in osteochondritis deformans juvenalis. Were the condition the result of faulty development, the causative factor must have been present when the first roentgenograms were made. Each of these cases could be accounted for by trauma.

Fairbank (7), in 1921, after giving a description of the disease as recognized today, concluded as follows: "As to the nature of the affection, nothing definite is known. The theory which receives the greatest amount of support is that trauma produces damage to the blood supply of the head of the femur, and that the changes in the ossification of the bone are secondary to this damage. Developmental error as a predisposing, if not the sole, cause, local infection, and rickets have all been suggested in explanation of the appearances. Tuberculosis and syphilis can undoubtedly be ruled out of court. Suffice it to say that there are difficulties in the way of accepting the traumatic theory."

Buckley (5), in 1921, reported a case of osteochondritis deformans occurring in a Jewess 32 years of age. In this case he observed similar changes in other joints, and believed faulty development to be the causative factor. He said: "Probably the predominance of the symptoms in the hip joint is to be explained by the insufficiency of bony development in the epiphysis of the head, and consequently its inability to bear the weight of the body and the strains normally thrown on that part of the bone, the result being an intracapsular fracture."

If we consider as osteochondritis deformans juvenalis only those cases which show in the early stages the typical broken-down appearance of the femoral head, and in the later stages the mushroom deformity, it is rather difficult to consider this condition as an intracapsular fracture.

Phemister (20), in 1921, reported a case in which operation was performed, the findings being similar to those of Kidner and Legg. Although in his case the cultures were negative, while in the others staphylococci were found, from his pathological findings he inclined to the belief that the origin was infection, with trauma playing the important rôle in localization. He advocated operation as the treatment of choice, but warned against destruction of the epiphysis which, in the writer's opinion, is one of the dangers of operation which is not emphasized strongly enough, as in unskilled hands the results may be far more disastrous than if the case were treated conservatively.

Roderick (23), in 1921, after reviewing the two types of limp, painless and painful, and the method of examination in suspected cases, said in conclusion: "A large percentage of recorded cases give a history of injury 4 to 6 months previously. . . . It is certain, however, that it must be one of three pathological processes: new-growth, inflammation, or degeneration, due to some circulatory disturbance."

Platt (21), in 1922, wrote the most comprehensive article on the disease since Legg's articles in 1916. He reviewed the entire literature from early history up to date, and the article is well worth reading. He reported in detail 35 cases under the following groups:

1. Pseudo-coxalgia in children;
2. Pseudo-coxalgia: the end-result in adult life;

3. Arthritis deformans juvenalis of the hip joint;

4. Miscellaneous hip-joint affections in which flattening of the femur is seen: coxa plana.

After giving reasons why he could not accept the theories of etiology advanced by various authors, he concluded in support of the theory of infection:

"1. Pseudo-coxalgia, or osteochondritis deformans juvenilis coxæ, is an inflammatory lesion of the upper end of the femur, the changes being subchondral in location.

"2. The condition is most probably due to a definite infection of low grade virulence. It is impossible to postulate the exact site of the primary implantation of the infection, which reaches the femur by the bloodstream; in the well-marked active phase, all the joint elements participate in the cycle of osseous changes.

"3. The disease is to be regarded as a definite pathological entity among the hip-joint affections of childhood.

"4. Pseudo-coxalgia shows a definite predilection for the second half of the first decade of life.

"5. In the period of adolescence, the reaction of the hip joint to the type and grade of infection which produces pseudo-coxalgia at an earlier age, is manifested by the production of an arthritis deformans. Arthritis deformans juvenilis is never seen during the age period appropriate to pseudo-coxalgia."

Yvernault (25), in 1922, reported a case occurring in a man 21 years of age, in which both hips were involved, the right more advanced than the left. In view of the fact that this was a patient of intelligence from whom no history of trauma could be elicited, other than injury to the right knee at 7 years of age, Yvernault considered the case to be in favor of the theory of congenital origin.

THEORIES OF ETIOLOGY

All writers on this disease agree as to the symptomatology, the diagnosis, and, in the main, the treatment, a few advocating operation as the most favorable treatment, while the majority advise rest both by relief from weight-bearing and application of a plaster spica. The debatable question is the etiology, and in the literature the following possible causes have been mentioned: (a) rickets, (b) syphilis, (c) congenital abnormalities, (d) variations in the endocrine glands, (e) infection, and (f) trauma.

Rickets. If one accepts the present day theory that rickets is due to a deficiency of the soluble vitamines and to a lack of sunshine and exercise, osteochondritis deformans juvenalis cannot be associated with rickets. Again, osteochondritis deformans juvenalis is more common in males than in females, which is not true of rickets; it occurs most commonly between the ages of 3 and 8 years, which is not the case in rickets; and the roentgenographic findings in the two diseases are not in any way similar. Therefore, this cannot be considered a favorable theory of etiology.

Syphilis. No evidence has yet been advanced indicating that syphilis has any bearing on these cases. The Wassermann reaction on the blood is invariably negative; the bone picture is in no way typical; evidences of syphilis in the bones, skin, or mucous membranes have not been found; and the patients recover without antisyphilitic treatment. Roberts (24) is the only author the writer has been able to find who favors this theory.

Congenital abnormalities. If congenital abnormalities were etiological factors, the condition would be present at birth, but so far no such cases have been reported. Again, cases have been reported in which roentgenograms have demonstrated a normal hip, and later roentgenograms have shown evidences of the disease. This would rule out congenital abnormality as an etiological factor.

Variations in endocrine glands. The theory of disturbed endocrine glands may be dismissed without comment until the function of these glands in development of bone is ascertained.

Infection. Of the several etiological theories advanced for this disease, those of infection and trauma have received the most attention. The early writers did not give much attention to infection; in fact, it was not until the condition was well established as a disease entity that infection was advanced as an etiological factor. The theory of infection has been ad-

vanced especially by Kidner, Phemister, and Freiberg. The two former have had operative cases; in Kidner's case a staphylococcus of low vitality was demonstrated, while in Phemister's case no growth was obtained. Freiberg based his conclusion on the characteristics of the disease, its onset, fever, etc., but the writer is inclined to think that Freiberg's case is not the typical picture seen in the majority of cases and should not be considered as of the usual type, but rather one in which an infection was superimposed on the process. With regard to Kidner's and Phemister's views, the writer, while believing that infection may be secondary, cannot view it as the primary cause; were this so, one would expect to see other joints involved, and the literature contains little suggestion of a like process in other joints, except in the work of Moody and Allison who reported what they considered similar changes in the shoulder, radius, and tibia. They inclined to the theory of trauma, however, and all their cases gave histories of trauma. Were infection the primary cause, one would expect to see in some case a virulent infection, if the general condition was poor; or, if the disease were hæmatogenous as suggested by Kidner, at least its uniform occurrence in males and females.

Trauma. The majority of writers support the theory of trauma, which the writer has found to be well sustained by the clinical findings in cases which he has observed, three of which are reported in detail.

CASE 1. G. R., a boy 9 years of age, was referred to the writer in October, 1916, with a diagnosis of tuberculosis of the right hip.

The family history was negative. The previous personal history was negative except for scarlatina at 4 years of age. Two years before, he had been struck on the right hip by an automobile. There was no evidence of severe injury, the roentgenograms were negative, and after 2 days in bed he was up and playing about as usual. He appeared to be quite normal until a year later, when his mother noticed that he limped. Inquiry at that time showed that he had jumped from a shed 3 weeks before, but had not sustained any severe injury. This was the only injury he had had after the trauma of 2 years before.

The general physical examination showed a well-developed, well-nourished boy, and was negative except for the condition of the right hip and leg. He complained of some pain in the anterior region of the right hip. He had no fever and no night cries. He walked with a marked limp, and there was some atrophy of the right hip and buttock, slight limitation in the internal and external rotation of the joint; there was no limitation of flexion, abduction and adduction, and no pain on any motion. Measurements showed one-half inch shortening of the right leg, with three-quarters inch atrophy of the thigh and one-quarter inch atrophy of the leg. The roentgenogram showed changes typical of osteochondritis deformans. Patient was placed in plaster cast from axilla to ankle, in the abducted position, with instructions to remain as quiet as possible. He was kept in the cast for 6 weeks, a short Lorenz spica was applied for 6 weeks, followed by a flannel spica.

Examination 4 months from the time of his first visit showed no shortening, no limp, and no pain. Slight atrophy was still present in the region of the buttocks. A roentgenogram showed some diminution in the bony changes about the epiphysis.

CASE 2. No. 10801. C. L., a girl, 5½ years of age, was brought to the Clinic in June, 1921, on account of limp. The family history was negative. The father and mother were living and well; one brother and one sister were living and well and there was none dead. The patient had had measles at 2 years of age, and enuresis for the past year. In December, 1920, she struck her left hip while sliding in a school yard. There was no immediate disability, but 3 weeks later she began to limp decidedly; there were no night cries, no loss of weight, and no complaint of pain in the hip. The limp continued and seemed to the mother to grow worse; she was told by a doctor that her daughter had tuberculosis of the hip.

The child was well developed and well nourished, and walked with a marked limp of the left leg. The general examinations, including urinalysis, Wassermann test, and examination of the blood were negative; the leucocyte count was 7,000. Examination of the left hip showed some prominence of the left great trochanter, but no shortening. The Trendelenburg sign was positive. There was 1 centimeter of atrophy of the left thigh, measured 6 centimeters above the superior border of the patella, as compared with the right. There was no pain on movement of the joint in any direction, but there was some limitation of the range of the joint in abduction and internal rotation. The roentgenogram showed the typical early deformity of osteochondritis deformans juvenalis, with the moth-eaten appearance of the epiphysis.

A plaster spica with the leg in 20 degrees abduction was applied, and the patient placed on crutches. At the end of 6 weeks a flannel spica was applied. The patient continued to use crutches for 2 months, after which time weight-bearing was gradually permitted, with exercises aiming to increase the range of abduction. At the end of 6 months there was no pain, no limp, no shortening, and no atrophy. A roentgenogram taken at that time showed the typical mushroom deformity of the later stages of the disease.

CASE 3. No. 5642. L. M., a boy 15 years of age, was referred to the Clinic in December, 1920, with a diagnosis of tuberculosis of the hip and with a request for roentgenographic examination and advice as to treatment. The family history was negative. The personal history was negative except for the condition of the hip. In March, 1920, the patient had injured the left thigh and leg while jumping, but this was not considered as at all serious. Two months later he began to limp, but did not complain of any pain. He was cared for by his family physician who advised him to use crutches and not to bear any weight on the leg. This treatment was carried out until December, 1920, when the patient came to the Clinic.

The general examinations were negative, except for the condition of the left hip. There was no atrophy, no shortening, and no complaint of pain, but some limitation to abduction and internal rotation. The roentgenogram showed the mushroom deformity typical of osteochondritis deformans juvenalis. Continued relief from weight-bearing for 3 months was advised.

The patient came under observation from time to time, and a roentgenogram taken in May, 1922, showed a decided improvement but the characteristic deformities of osteochondritis deformans juvenalis were still present. The general condition was excellent and there was no limp, no pain, and no shortening.

These three patients gave definite histories of trauma. The patient in Case 1 had a negative roentgenogram at the time of his first trauma, and the typical deformity of osteochondritis deformans juvenalis 2 years later, which would appear to rule out the theory of congenital malformation.

CONCLUSIONS

1. The typical changes as found in this condition should be classified as a separate disease entity, under the name of osteochondritis deformans juvenalis.

2. The condition has a definite symptomatology.

3. It is due to trauma which causes a disturbance of the arterial supply about the epiphysis. An infection may be superimposed on the original process.

4. Osteochondritis deformans juvenalis should not be confused with tuberculous coxitis.

5. Children from 3 to 10 years of age, who have painless limp, should have roentgenographic examinations to rule out the possibility of osteochondritis deformans juvenalis.

6. Treatment should be by relief from weight-bearing and by application of a plaster spica for from 3 to 6 months. Operation is indicated in but a small percentage of cases.

7. The end-results will be good invariably if the proper treatment is carried out.

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DIVERTICULA OF JEJUNUM—A CASE WITH ENTEROLITH CAUSING INTESTINAL OBSTRUCTION

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WHILE diverticula of the large bowel and more recently those of the duodenum are found not infrequently, examples of their presence in the jejunum are still rare. Since Sir Astley Cooper in 1844 reported a necropsy specimen with multiple diverticula in the jejunum, but twenty-five additional instances have been collected by a careful search of the literature. With a few exceptions these were discovered at necropsy, in individuals dying of ailments in no way related to the diverticula.

In 1921 Terry and Mugler reported a patient upon whom an operation was performed for intestinal obstruction, where the obstruction was found to be caused by an enterolith which had formed in a diverticulum of the jejunum. In May of the past year I operated on a man of 73 suffering from obstruction, in whom we discovered multiple diverticula of the jejunum. One large one was distended with an enterolith, the weight of which by traction and angulation was causing the intestinal bloc.

The history and operative findings in this case are as follows:

Benjamin P., an American, age 73, straight, slender, and well nourished, a very well preserved old gentleman. Ten days before admission to the Presbyterian Hospital he consulted his physician, Dr. C. S. McGeorge, on account of pain in abdomen. Previous to this he had experienced more than usual trouble in getting bowels to move; also some gaseous distention and disinclination for food, but no vomiting. No diarrhœa unless induced by cathartics. Difficulty in overcoming constipation was becoming progressively more marked. He had noticed no blood in stools.

On palpating abdomen his physician discovered a firm, rounded, walnut-sized tumor, a little to the right and below the umbilicus. The mass was movable but not particularly sensitive.

On entering hospital the abdomen was soft, but slightly distended, while the distended coils of intestine with their active peristaltic efforts were readily discernible through the abdominal wall. He presented the scar of an old gall-bladder operation. This was performed elsewhere after a second attack of epigastric pain 7 years ago. Patient felt that this operation benefited him little or none, and it required a great deal of persuasion to induce him again to come to a hospital.

Owing to the partial obstruction, a barium meal was not given but an enema instead. Dr. George Grier made the following report: "There is a constant constriction and partial obstruction to the barium enema in the lower part of the sigmoid. We believe there is an organic lesion of the sigmoid."

Operation, May 4, 1922. Incision was made through middle of left rectus. A firm, rounded tumor was found between the layers of jejunal mesentery, near the apex of the proximal loop. This was causing an incomplete obstruction by traction from its weight, with the resultant angulation. The tumor also encroached upon the intestinal lumen. On proximal side, the jejunum was of large caliber with thick walls. The tumor was about the size of an unhulled walnut, hard and smooth. But one coil of intestine was delivered: Throughout its exposed extent, at quite regular intervals were distributed diverticula on the mesenteric border. They were thin walled, empty, and of nearly uniform size, averaging about 1 inch in diameter.

Eight inches of jejunum and its mesentery with the involved tumor was resected, and an end-to-end anastomosis made. We believed the lesion to be malignant (carcinoma), growing from the wall

Fig. 1. Multiple diverticula of the jejunum with partial intestinal obstruction from an enterolith within the largest one.

of diverticulum and distending its lumen, and accordingly divided both intestine and mesentery with the cautery knife wide of the new-growth. The left colon and sigmoid were examined and found normal.

On section of tumor we found it to consist of a large enterolith tightly distending a diverticulum. In the resected intestinal segment were four additional diverticula much smaller than the one containing the stone and causing the trouble.

Patient left the hospital in 3 weeks and returned to his business at an early date. His physician reports him well.

The numerous diverticula aside from the one containing the stone were empty, free from adhesions and presented no evidence that they had in any way caused trouble. They were situated between the layers of the mesentery, of fairly uniform size and placed at such regular intervals as to suggest a relationship of their necks to the vessels entering the intestinal wall from its mesentery.

The following are brief abstracts of the cases found in the literature:

JEJUNAL DIVERTICULA FOUND IN THE LITERATURE

1. Cooper, Sir Astley, 1844, reported a case of multiple diverticula of jejunum found at autopsy in a male of 50, dying from cirrhoses of liver. The diverticula were false in type, situated between the layers of the mesentery, and ranging in size from a pea to a walnut. No relation to death of patient.

2. Cornillon, in 1869, reported a diverticulum, the size of a hen's egg, false in type, single, and situated between the layers of the mesentery near middle of jejunum. Discovered at autopsy in a woman of 30 dying of placenta prævia.

3. Osler, William, 1881. reported the case of a man of 65, dying of an enteric attack with melæna, in whom at autopsy he discovered 53 diverticula, false in type, situated between the mesenteric layers, varying in size from a cherry to an apple, having no relation to death. For years he had suffered, after eating, from rumbling noises and colic-like pains.

4. Moore, in 1883, in the case of a man dying of bronchitis, discovered at autopsy three diverticula, true in type, situated in the mesenteric border, associated with a stricture of jejunum near its beginning and evidently of congenital origin. No evidence that diverticula had caused symptoms.

5. Buzzi, in 1885, reported a single diverticulum in the first portion of jejunum, containing all coats and situated at mesenteric border, 23 by 32 millimeters in size. It was found at necropsy in a man of 77 who died of peritonitis, the result of perforation from pyloric carcinoma. All intestinal coats were present.

6. Buchwald and Janicke, in 1887, reported a case, found at operation, in a boy of six suffering from obstruction of the bowel, due to a cystic tumor of jejunum which proved to be a diverticulum the communication of which with intestinal lumen had become sealed. This was of the true type, situated on the mesenteric border, probably congenital.

7. Virchow, in 1890, reported an autopsy specimen with multiple diverticula of jejunum and ileum. Those in jejunum the size of a hen's egg were on mesenteric side and false in type, with large openings communicating with intestine. The body was that of an emaciated old man.

8. Edel, M., in 1894, reported a necropsy specimen with seven diverticula of jejunum, ranging in size from a walnut to an apple, situated on the mesenteric side, with blood vessels coursing over them. Many diverticula were also found in colon. This in a woman of 73.

9. Seippel, in 1895, reported a case, discovered at autopsy, with sack-like protrusions between the layers of the mesentery in lower portion of jejunum, one about the size of a walnut. These were false in type.

10. Good, in 1895, reported a necropsy specimen in a female of 77, presenting 6 diverticula in jejunum with one in duodenum. These were false in type, situated between the layers of the mesentery and over some of which vessels coursed.

11. Hansemann, in 1896, reported an autopsy specimen found in a boy of 14 in which was a single diverticulum in jejunum on convex surface of bowel. To its apex was attached an accessory pancreas.

He also reported a case of a man of 85 dying from pneumonia, in whom he found 400 small diverticula mostly in jejunum and situated at the point of entrance of blood vessels on mesenteric border.

12. Grassberger, in 1897, discovered at autopsy on a man of 73 many pea sized and 13 walnut sized diverticula in jejunum. All were on mesenteric border and devoid of muscular coat. There was also a diverticulum in the stomach, 2 in the duodenum, and many in the colon; these also were on mesenteric border and without muscular coat. This man died from a perforating ulcer of duodenum.

13. Nicholls, in 1899, reported from a necropsy in a woman of 64, 50 diverticula in the jejunum varying in size from a pea to a walnut. All were on the mesenteric border and were hernias of mucous and submucous coats through muscularis. This woman had had double inguinal hernia for 30 years and a bronchitis for 25.

14. Fisher, in 1900, reported a museum specimen of a portion of jejunum containing a bean sized diverticulum within the mesentery, and with a small communication with the intestinal lumen. This was a hernia through a defect in the muscularis.

15. Gordinier, H. C., and Sampson, J. A., in 1905, reported the operative findings in a woman of 45. She had had what appeared to be an acute attack of appendicitis and three weeks subsequently developed obstructive symptoms with tenderness. At operation for intestinal obstruction 13 diverticula

were found in 40 centimeters of lower jejunum and upper ileum. They were on mesenteric border, had large openings, were false, and with large vessels coursing over each one. One was acutely inflamed and through adhesions to colon was causing obstruction by kinking. Involved diverticulum was removed and abdomen drained. The others were not disturbed. Patient recovered.

16. Taylor and Larkin, in 1910, reported a necropsy specimen in a woman of 68 dying from pneumonia, in which were a large number of diverticula, ranging in size from a pea to an unhulled walnut; they were situated between the layers of the mesentery and were false in type. There were also numerous sacculations in the colon.

17. Balfour, in 1913, reported a case upon whom he operated for duodenal ulcer. Several diverticula were found in upper jejunum; between this portion of the jejunum its mesentery and the mesocolon were numerous adhesions which caused Balfour to do an anterior instead of the contemplated posterior gastro-enterostomy. The diverticula were not disturbed and as the patient obtained a symptomatic cure evidently played no part in the symptomatology. The diverticula ranged in size from a hazelnut to a walnut and were situated on the mesenteric border.

18. Latarjet and Murard, in 1914, reported a necropsy specimen in a woman of 50. There was a single diverticulum in the jejunum 2.5 by 5 centimeters in size. It was on the mesenteric border with its neck in relation with the bloodvessels.

19. Braithwait, in 1918, reported a necropsy specimen in a man aged 45 who had died in Guy's Hospital of another condition. There were two diverticula in the second part of the duodenum and 60 in the proximal 3 feet of the jejunum. They were on the mesenteric side. The largest, 25 centimeters in diameter.

20. Case, in 1920, reported two cases of jejunal diverticula found in the course of routine roentgen-ray examinations and subsequently confirmed at operation: The first, a man of 61, had complained of gastric discomfort and distress for 10 months and for the last 6 months a great deal of intestinal flatulence. Perhaps a dozen diverticula were found in upper jejunum, mostly the size of a pea but one large one 5 centimeters in diameter. There were signs of peridiverticulitis about the large one. No other findings to account for symptoms. Resection was followed by recovery.

The second case a man aged 73 with a history of gall-bladder disease in whom they had by roentgen-ray diagnosed jejunal diverticula. He later entered another institution where during the removal of his gall stones the presence of the diverticula was confirmed.

21. Terry and Mugler, in 1921, reported the case of a woman aged 59, in whom at operation for duodenal ulcer, 5 diverticula of the upper jejunum were found. All were located on the mesenteric side and the two larger ones treated by inversion. A year and a half later, she was operated on for intestinal obstruction caused by an enterolith forming in one of the diverticula.

22. McWilliams, in 1921, found at autopsy, in a man aged 71, dying from thrombosis of the superior mesenteric artery, seven large diverticula in the jejunum. They were situated at the mesenteric border in close relation with the bloodvessels. They evidently bore no relation to his terminal illness.

23. MacKechnie, in 1921, treated a woman aged 43, suffering from abdominal pain and progressively increasing difficulty in obtaining bowel movements. Pain more marked in past 2½ months, and increased by efforts to secure bowel movement. Diagnosis: Incomplete intestinal obstruction. At operation, upper jejunum for two and a half feet was found dilated to 2½ inches in diameter. On the mesenteric border were 13 diverticula varying in size from a split pea to a pigeon's egg. Duodenum was also dilated with two large diverticula also on mesenteric edge. No obstruction. No pathology other than this. A duodeno-jejunostomy was performed as a temporary expedient, but patient died in collapse 3 hours later. At necropsy the diverticula were found to be thin walled-false in type with almost complete absence of muscular coat. They were in close proximity to large vessels.

24. In Akerlund's case, reported by Schlesinger: A thin walled diverticulum was found at necropsy in a female of fifty, close to the jejunal flexure in the uppermost portion of the jejunum. It lay behind the pancreas and when distended, extended beyond the upper border of the latter. The X-ray showed shadow simulating that in a perforating gastric ulcer. The patient died 10 days following a posterior gastro-enterostomy. At time of operation the diverticulum was not discovered.

Of the 26 instances of jejunal diverticula found in the literature, 18 were revealed at necropsy in persons dying of causes in no way related to them. In only one of these is there any evidence that the diverticula had caused symptoms during life: In this case, reported by Osler: A man of 65, dying of an enteric attack with melæna, had for years suffered after eating from rumbling noises and colic-like pains.

Of the 8 cases found at operation, two were unrelated to the symptoms leading to the opening of the abdomen. In one they were found in the course of an operation for gall-bladder disease, and in the other their presence caused the operator to perform an anterior instead of a posterior gastro-jejunostomy for duodenal ulcer. Both of these patients were relieved of their symptoms and we may infer that the diverticula were re-

sponsible for no trouble. Of the remaining 6 cases; in one, obstruction of the jejunum was produced by a cyst of the mesentery, thought to have had its origin in obliteration of the neck of a true sack. In another operated upon for obstruction, numerous diverticula were found in jejunum and duodenum but no obstruction and no other pathology to account for symptoms. One patient suffered from diverticulitis and was cured by a resection. In another, obstruction was caused by adhesions, the result of a peridiverticulitis. The patient of Terry and Mugler has already been referred to. Our own case, forming the basis of this paper, has also previously been described.

In but two instances has a diagnosis been made by roentgen ray and subsequently demonstrated at operation; both of these were made by Case.

Where sex was mentioned, 14 were in males and 9 in females. The youngest was 6. This and another of 14 were single, possessed of all coats, and probably congenital. The next youngest was 30, this was also single but false in type. Between 30 and 40 there were none; 40 and 50, 5; 50 to 60, 1; 60 to 70, 4; 70 to 80, 7; and one, the oldest, was 85.

Those found early in life are apt to be congenital and possessed of all the intestinal coats; while the acquired have been mostly observed after 45; their walls thin, and commonly devoid of muscular coat—the false type in contradistinction to the former or true.

In one of the cases, reported by Hansemann, there were 400 small diverticula mostly in the jejunum. This is the greatest number found in any one instance.

Acquired diverticula are thought to be due to senile changes in the intestinal musculature; loss of adipose tissue; dilatation of the vascular sheaths as they enter the intestinal wall, caused by the varying caliber of the blood vessels; and to any cause tending to increase the intra-intestinal tension. The mucosa or the mucosa and submucosa are pushed through the defect in the muscularis, usually at the point of entrance of the larger vessels.

In support of this theory is the fact that nearly all the cases have been found late in life, are practically all on the mesenteric border, either to the side of or between its layers, frequently are in close relation to the larger blood vessels, and often distributed with a regularity similar to them. One diverticulum, a single congenital sac, was on the convex border; the position of another was not stated; all the others were on the mesenteric side.

Of the seven cases of jejunal diverticula causing symptoms, in three they were those of obstruction. In one patient, a woman of 45, there was what appeared to be an attack of appendicitis; 3 weeks subsequently she developed obstructive symptoms with tenderness. Another complained of gastric discomfort and distress for 10 months, and for 6 months a great deal of intestinal flatulence. In another there was abdominal pain and progressively increasing difficulty in obtaining bowel movement; pain was more marked in last 2½ months and was increased by effort to secure bowel movement: no obstruction or pathology other than diverticula with jejunal dilatation was found in this case.

Diverticula in the small intestine are not likely to be considered in the diagnosis of abdominal conditions, other than as a rare possibility, except where their presence has been demonstrated by roentgen-ray examination. Even where diverticula have been left unmolested at operation, subsequent X-ray examination has failed to demonstrate them. The two instances of pre-operative diagnosis by Case, and later proved by operation, are the only ones we have been able to find in the literature.

TREATMENT

In three instances, including our own case, the jejunum with the offending diverticula was resected. All three recovered. In a case of diverticulitis, the diverticulum was removed and the abdomen drained. This patient also recovered. A patient in whom a duodeno-jejunostomy had been performed, died shortly afterward.

In the case of Terry and Mugler, at time of first operation, the larger diverticula were inverted; a year and a half later, an enterolith causing obstruction was crushed within the

sack, passed on through the intestine, and the diverticulum inverted.

Where the diverticula are excised or inverted, the suture line should be at a right-angle to the longitudinal axis of the intestine, and care taken not to interfere with its blood supply.

Since the contents of the small intestine are liquid, and in the jejunum fairly sterile, these sacculations may be causing no trouble; and in such a case, where discovered in the course of the treatment of some other lesion, and particularly so when small and multiple, it will be the course of wisdom not to molest them. When, however, they are the seat of inflammation, found as the cause of obstruction, or through stagnation inducing auto-intoxication, surgical treatment is indicated, usually, inversion, excision, or intestinal resection

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GANGRENE OF THE EXTREMITIES COMPLICATING PUERPERAL SEPSIS

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PUERPERAL gangrene of the extremities, while of infrequent occurrence, is of such serious consequence that it should be kept in mind and considered a possibility in every case of puerperal sepsis and septic abortion.

In 1916, in an excellent paper, Arthur Stein reported 2 cases and reviewed the literature up to that date giving abstracts of 74 authentic cases besides his own. In Stein's series, 63 cases followed labor, 4 followed septic abortion, and 4 occurred during pregnancy. He also reported 5 cases which followed gynecological operations. Knipe, in 1917, added 1 case which followed septic abortion. To these I wish to add 1 case which followed labor (being first seen by me 10 days after delivery).

A robust woman, age 19, was delivered of her first pregnancy by means of forceps, on May 12, 1922, after being in labor about 24 hours. Ether anæsthesia was used and no especial difficulty was encountered in the delivery. She had only a normal amount of hæmorrhage and her perineal lacerations were slight. The child was alive and the placenta and membranes came away without difficulty. The day after delivery she had a severe headache, felt nauseated and had some fever but she did not know how much. The evening of May 14, 2 days after delivery she developed a high fever, felt very ill, and there appeared over the body and extremities a fine red eruption. The temperature rose to 104 or 105 degrees and remained high. The eruption disappeared in 4 or 5 days. There was never any sore throat or cervical adenopathy although a diagnosis of scarlet fever had been made. On the morning of May 18, 6 days after delivery, she complained of a feeling of numbness in the feet. It was then noticed that both feet showed a bluish-red discoloration which extended to the ankles and that both feet were slightly swollen. By 5 p.m. of that day she began to complain of severe pain in both feet. This pain continued and became so excruciating that morphia had to be given frequently for relief. She complained bitterly when heat was applied and maintained that cold applications relieved the pain.

When seen by me, on May 22, 1922, 10 days after delivery the patient presented a picture of severe sepsis. The temperature was 104.5 degrees, the pulse rapid and weak and prostration was great. Both feet were of a bluish-red color extending up to the ankles, the toes being almost black and beginning to become dry. The swelling extended half way to the knees and there was no definite line of demarcation. The feet were cold and there was no pulsation in either dorsalis pedis artery. The femoral or saphenous veins did not feel thrombosed. This condition persisted for about a week, the pain being almost unbearable, after which the circulation in the feet began to improve. The cyanosis in the dorsum of the feet began to disappear but the ends of all the toes became hard and dry, the line of demarcation forming at the distal articulation of each toe. The dry gangrenous portion was removed. By June 16 when last seen she was still bedfast with a fever reaching as high as 102 degrees each day. She had a large indurated mass in the right side of the pelvis and the fundus of the uterus was fixed. The toes were healing well and were giving her no trouble. She subsequently made a complete recovery.

A review of the reported cases shows that puerperal peripheral gangrene occurs most frequently in the lower extremities involving one or both, less frequently in the upper extremities and rarely involving a hand and a foot. In one case there was symmetrical gangrene of the fingers, toes, and ears.

ETIOLOGY

It is not the purpose of this paper to discuss the etiology of gangrene in general. It is known to occur in practically all the acute and chronic infectious diseases as well as in all the chronic wasting and cachectic diseases as a result of thrombosis or embolism. Puerperal peripheral gangrene occurs following occlusion of an artery, a vein, or both, this circulatory block being brought about by the following means: Arterial embolism, coming from deposits on the valves of the left side of the heart in a complicating septic endocarditis or from thrombi forming chiefly in the left auricle as a result of endocarditis. An embolus might also come from thrombosed pelvic veins and reach the left side of the heart through a patent foramen ovale. Wanner, Oliver, and Papow reported cases of this kind and cases are cited by Welch in connection with other diseases. Emboli may also come from the detachment of a piece of thrombus in a large

artery which is arrested peripherally where the vessel lumen is smaller.

Arterial thrombosis may occur by a thrombus in the uterine artery or its branches in the placental site growing by extension until it reached the internal iliac from whence it might extend up the common iliac to the aorta and down the external iliac to the femoral and its branches. Arterial occlusion may also occur from thrombus formation as the result of a septic or toxic endarteritis anywhere in the arterial system or from a secondary endarteritis through propagation of infection by contiguity from an adjacent vein.

Venous occlusion may occur as the result of a septic or toxic thrombophlebitis or by the extension of a thrombus from the veins of the broad ligament into the iliac vessels to the vena cava and down into the femoral vein. It may also occur by the extension of infection by contiguity from an adjacent artery producing a thrombophlebitis or by the interruption of the circulation in the concomitant artery. In the so-called arteriovenous thrombosis cases, a thrombus forms secondarily in one system due to complete blocking of the circulation in the other. In many cases it is difficult to tell where the clot first formed.

The causative factor in puerperal peripheral gangrene is infection. In the study of the material in the literature, it is noted that infection was invariably present. This varied from a mild infection with a low temperature lasting only a few days to the most severe type of puerperal sepsis. Either a streptococcic or a mixed infection was present. Knipe's case showed bacillus aerogenes capsulatus and Gram positive cocci in pairs and in chains.

The circulatory block in most of the cases was the result of an endocarditis the deposit on the heart valves acting as an embolus or of a septic or toxic endarteritis and thrombus formation. Puerperal gangrene of venous origin is relatively rare. Varicose and thrombotic veins of the genitalia are common during pregnancy and after childbirth, and phlegmasia alba dolens, the result of obstruction of the iliac veins, frequently complicates labor yet rarely terminates in gangrene.

Contributing causes of thrombosis are low blood pressure and sluggish blood stream caused by severe hæmorrhage or weakened heart action, recumbent position and relative immobility of the entire body, lowered resistance against infection and, according to Mendel, abnormal constitution of the blood, favoring thrombosis.

I believe that my case was due to arterial occlusion, the thrombus being located in the pelvic vessels perhaps extending into the femoral vessels. The gangrene was dry, the legs were not œdematous as one would expect with extensive venous thrombosis, the circulation re-established itself in all parts except the distal ends of the toes. Occlusion of the femoral or iliac arteries usually affect only the feet or even the toes while blocking of the popliteal or anterior and posterior tibial arteries usually causes gangrene up to the obstruction. Pulsation in the dorsalis pedis was absent, no thrombosed veins were palpable and there was no evidence of endocarditis.

SYMPTOMS

Infection being the etiological factor, a fever always proceeds the onset of the symptoms of circulatory blocking. This may be only a slight rise indicating a mild infection or a temperature of 104 or 105 degrees indicating the graver types of puerperal infection. A septic endometritis was present in practically all of the cases reported. Pain is always present and is usually excruciating. The severe pain usually subsides when the line of demarcation forms and the general condition of the patient becomes worse due to the absorption of necrotic tissue elements. Sensation is diminished in the affected part early and there is often increased sensitiveness to painful impressions. Motion is not interfered with. A discoloration of the affected area with diminished local temperature is present in threatened gangrene. Demarcation finally takes place but death may intervene from general sepsis before the line of demarcation is established.

DIAGNOSIS

The diagnosis of a threatened or an existing gangrene is obviously not difficult. Differentiating between an arterial or venous block or finding the location of the obstruction is often difficult and sometimes impossible. An

abrupt onset usually points to an arterial blocking. Stein says: "The early appearance of gangrene in the first few days of the puerperium points to an arterial (the most common) origin." The absence of arterial pulsation below the obstruction is found in arterial blocking. The gangrene is usually dry in arterial occlusion and moist in venous. Local œdema, however, is usually characteristic of venous blocking. Thrombosed pelvic veins are often palpable by rectum of vagina.

PROGNOSIS

The prognosis is bad. There is at least a 50 per cent mortality. The mortality is governed by the time amputation may be done and the severity of the puerperal infection. Whether the block is arterial, venous, or arteriovenous has no bearing on the mortality.

TREATMENT

Prophylactic measures consist in the conduction of labor cases in a manner to prevent puerperal infection, and, if it is present, to abstain from intra-uterine meddling. Heart stimulants should be given to increase blood pressure when the heart is weak. The patient should be kept as quiet as possible to avoid loosening thrombi when formed and palpation of affected veins should be as gentle as possible or dispensed with altogether. All unnecessary movements or manipulations should be avoided. Sodium citrate has been advocated as a prophylactic measure against thrombosis in typhoid fever. It might be used in puerperal sepsis.

Active treatment consists of treating the puerperal infection as well as the affected part. The affected extremity should be elevated in venous blocking, it should be kept warm by the application of heat by means of hot fomentations of lead water and opium which also helps lessen the pain. Morphine should be given for pain and the circulation should be sustained by heart stimulants. An early amputation is the most important factor when the condition is such that one can operate above the occlusion. Some work has already been done in removing emboli from arteries and as the skill in blood-vessel surgery increases this may become the proper way to handle many of these cases, but as yet the technical difficulties are too great.

CONCLUSIONS

Puerperal peripheral gangrene, while not common, may occur in any case of puerperal sepsis or septic abortion.

It is always preceded by infection.

It is most frequently of arterial origin.

The mortality is 50 per cent or more.

The most important step in the treatment is early amputation of the gangrenous part.

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CHRONIC APPENDICITIS—IS IT A MYTH?[1]

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PHYSICIANS like other men are often victimized by first impressions from which they escape only with great difficulty. It is true that by doubting we come to question and by seeking we may come upon the truth (Abelard), but it is also true that man is disposed nowadays to view with distrust almost any long established institution or idea whether good or bad often for little reason excepting that it is old and established and respectable.

A somewhat oracular and at the same time iconoclastic dictum recently passed down from a medical Parnassus on the Atlantic seaboard has had the effect of disquieting many internists and a respectable proportion of surgeons in their attitude toward chronic appendicitis. The wide circulation given the bright laconocism in question and the high position and character of its author have caused in some quarters what one might designate as an attitude of distrust toward surgery in the treatment of chronic appendicitis. The declaration to which I refer is familiar to most physicians. It is: "There are two kinds of appendicitis; acute appendicitis and appendicitis for revenue only." With respect to this assertion the attitude of some of us is for the present at least one of respectful discredence.

The delightful epigram quoted has directness and force as well as piquancy. It is as clean cut as freshly minted coin. It has in it at least a tithe of truth but it is pregnant with mischievous possibilities. As to the tithe of truth, all of us know that there are ill-prepared surgeons who jump quickly to the conclusion that right-sided, lower abdominal pain in a man means appendicitis surgery and also that there are unconscionable surgeons who are ready to operate upon as appendicitis cases any one who, as Haggard observes, will lie still long enough. For all these the snappy admonition noted is appropriate and needed but what of the possibilities of mischievous misguidance which lurk in its challenge.

Assuming that this view is to dominate us what then is to be the attitude of practitioners and laymen toward interval operations. Consider the probable misinterpretations. What cases are we to embrace under the heading, "Acute Appendicitis Requiring Operation"? What impression would be left by our withdrawal from the field of chronic appendicitis like an army defeated through its own sheer stupidity? Bernarr McFadden would know how to evaluate such a movement. Let us make no illusions for ourselves. All of his kind would seize upon and utilize it to their advantage as they did similar material in the case of another widely heralded pronouncement to the effect that 50 per cent of diagnoses made in one large and much honored hospital were erroneous. The autopsy cases were, of course, the puzzling ones and the 90 per cent of all cases seen by doctors and which recovered are ignored. This, however, is of negligible interest as compared with the dangerous confusion which the apothegm we are considering tends to create in the minds of physicians.

A confusion must result from a too liberal interpretation of the admonition that surgery in chronic appendicitis has little or no value. Many surgeons are, of course, yet to be convinced that surgery is valueless in chronic appendicitis and some are of the opinion that general support of the non-surgical plan of treating chronic appendicitis would kill as many as an army corps in this country every year, but assuredly very few of us were prepared for the almost violent assertion made in a recent article that "chronic appendicitis is a myth." Is not this opinion in conflict with elementary basic principles of pathology? Upon what study or authority does the denial of a chronic stage to this particular inflammatory process rest. For example may not intestinal parasites or irritant bodies induce a chronic inflammatory process in the appendix? One could bring volumes of case reports with pathology findings proving the entity of chronic appendicitis, and on the other hand

[1] Read by invitation at the meeting of the Tennessee State Medical Association, 1923.

one cannot call to mind any meritorious effort on the part of any pathologist to sustain the view of those clinicians for whom chronic appendicitis does not exist.

If the statements thus far made mean anything they mean that there is at present wide divergence of view among intelligent physicians as to whether chronic appendicitis exists as an entity in pathology and that there exist more widely divergent views as to whether the condition, its entity in pathology being admitted, has any standing in clinical surgery. For such a widespread conflict of opinion there must be a reason of wide application. This reason is perhaps to be sought in a general misunderstanding of the nature and behavior of chronic appendicitis especially in its broader relations and associations.

The narrow view of chronic appendicitis and the one commonly held if one may be acquitted of pedantry is set forth in nearly every text on the subject. Most textbooks in their chapter on this matter treat chronic appendicitis as a distinct and separate pathological entity, whereas chronic appendicitis, so long as it remains chronic, is interesting almost solely because of its associated pathologies, reflexes, sequelæ, etc.

Mestivier in 1759 (1) reported a perityphlitic abscess due to the presence of a needle in the vermiform appendix, LAMotte in the same publication several years later found an enterolith in the appendix with appendicular peritonitis, Lauyer-Villermet, in 1824, and Melier in 1827 (2) described appendicitis gangrenosa. Later Laudet called attention to the relationship between ileocæcal abscess and infection of the appendix and so articles have been written down to the line of Morton, Fitz and McBurney, nearly all studies of the infections of the appendix have been addressed to the acute or abscess stage.

There is, however, without any doubt a chronic form of appendicitis. Moreover, there are chronic types of appendicitis which apparently have never passed through an acute stage (3) and which either continue indefinitely in the chronic form or finally, through faulty drainage, augmentation of bacterial agents, and lessened resistance, develop the phenomena of acute infection. It is probable, however, that many of these apparently purely chronic forms result from light, clinically overlooked acute attacks; for example, the milder acute attacks of very early childhood. Wilms believes that such low-grade acute forms are much more common in infancy than is generally recognized. Moreover, the infant may come into the world with a chronic appendicitis. Peritonitis of the fetus *in utero* is an established fact. The favorite diagnosis in chronic appendicitis of infancy is chronic enteritis, in many such cases the appendix being solely to blame.

Under the name appendicitis larvata, Ewald described a form of appendicitis in which the physician judging from the syndrome is inclined to diagnosticate almost any condition rather than chronic appendicitis. Patients thus afflicted complain of diffuse, vague stomach and intestinal symptoms, acid eructations, anorhexia disagreeable sensations on taking food, obstipation with tenesmus and pain. In men the condition is often ascribed to stomach and intestinal catarrh; in women to hysteria, etc., but patient observation and repeated examination bring proof that at the bottom of the syndrome lies a chronic appendicitis.

For the present it will surely be safer for us of the "common run" to cling to the belief that the chronic appendicitis syndrome—nausea, vomiting, eructations, hard right rectus muscle, tenderness at McBurney's point, meterorism at the cæcum (the balloon symptom) Rovsing's gas pressure pain, sex gland pain, weakening of the cremaster reflex, funiculitis, pain on coughing and on introduction of the examining finger into the right inguinal canal and on deep right rectal and vaginal pressure—all these things mean chronic appendicitis and demand removal of the appendix notwithstanding the contrary view of the brilliant internist epigramatist.

The most cogent reason for not temporizing in such cases, awaiting a clear cut acute attack, is that it is very difficult to determine just what pathology underlies the symptom group reviewed above. My own experience is not an unusual one, neither its volume nor its fiber being remarkable in any way and yet it has brought out many cases of clinically

quiescent appendicitis with no history of an acute attack in which operation revealed a truly dreadful inflammatory condition in and about the appendix. In a recent instance a young man giving no history of acute illness pertaining to his abdomen and presenting only the common signs of chronic appendicitis, was found upon operation to have an appendix thicker than one's thumb and 5 inches long lodged in a bed of tough adhesions situated retrocæcally and subhepatically. This is a common finding, a retrocæcal appendix tied down in a mass perityphlitis adhesions as described long ago by Virchow. Here we find not infrequently what Dr. Percy, of San Diego, would designate as a "God awful" state of affairs and yet expressing only the mild symptoms of a classical chronic appendicitis; symptoms which the pacifists of abdominal therapy are adjuring us to ignore.

I have operated upon a boy for general purulent peritonitis who ploughed the day before and a girl for the same condition who had prepared dinner for a harvest crew the day previous to her operation. Did this serious pathology develop over night or was it wholly or in part present the day before operation when the patients seemed well? It is much more reasonable to assume that there was a chronic appendicitis present days or weeks or months before the frankly acute attack and without symptoms. Patients with purulent appendicitis have walked into my consulting room more than once. It is difficult to determine the nature and severity of appendiceal infection without operation. Here surely the first aphorism of Hypocrites "Judgment is uncertain and experience fallacious" must be set aside if we accept the view of those who call chronic appendicitis a myth and discountenance operation therefore.

Is chronic appendicitis a myth? Few indeed will subscribe to the statement that chronic appendicitis does not exist at all. The element of danger lies in the contention that chronic appendicitis is very rare; that it is a non-surgical condition; that normal appendices are being removed by every surgeon everywhere in great numbers. If one were to depend for justification upon microscopic pathological findings alone, then truly in many cases normal appendices are removed by capable conscientious surgeons without justification. However, such surgeons need not and do not depend alone upon the pathologist, who cross sections the appendix for their justification, for they have too often seen the whole right half of the abdomen, especially the region of the terminal ileum and cæcum filled with adhesions fettering and deforming the appendix and producing traction upon its mesentery. They have seen the deep congestion of all of the branches of the ileocolic artery and vein and they have seen and appreciated the appendix in its relation to colitis and stasis in cases in which the appendix because of an adhesion to its peritoneal surface deforming its lumen has ceased to drain and has become a veritable culture tube of the devil fabricating toxins which in the colon excite colitis, pericolitis, adhesions, stasis etc.

In other words a conscientious surgeon can readily admit that with a proper sense of his duty he may be ready to excise an appendix in which the pathologist sectioning its walls can find nothing abnormal, because the symptom producing lesions are extraneous to the walls of the appendix except perhaps for a small peritoneal tag, the result of the separation of an adhesion on the peritoneal coat which, though it might have caused deformity and interfered with drainage, need not of necessity have caused characteristic cell changes in the appendix wall.

Even slight adhesions of the appendix may, as is well known, give rise to disturbances in structures remote from the ileocæcal region. Adhesions at the appendix causing constriction and fixation of the intestine lead to mechanical distortion with stasis and colitis and by establishing abnormal functional conditions give rise to aberration in the behavior of many parts of the gastro-intestinal tract through the agency of reflex action. Thus in some instances, as Hewes has explained, spasm of abnormality of peristalsis of portions of the gut, stasis of fæcal contents or gas may occur in portions of the gut far removed from the actual seat of the lesion without the finding of any anatomical variation in the portion where the function is disturbed, for example dis-

turbances of the stomach with imperfect emptying of contents may occur in cases in which no distortion of the stomach or duodenum is present and in which the only anatomical abnormality found is an adhesion of the appendix to the cæcum with stasis of the latter.

In this same manner the contralateral pain not rarely associated with chronic appendicitis may be explained without yielding ground to those who would have us abandon our studies of chronic appendicitis as misdirected and futile.

Anthony Bassler (4), reports a case of chronic appendicitis simulating angina pectoris. Cases of chronic appendicitis diagnosticated as disturbance in the gall bladder, gastroduodenal ulcer, and various functional gastric disturbances are well known, operation usually disclosing the misdiagnosis, generally with relief to the patient from the operation.

The patient of Bassler, a stock broker, aged 50, came under observation, Jan. 17, 1922. His father died of "heart disease," his mother of apoplexy. His past history was negative. He had been constipated most of his adult life, excepting on vacations, so he thought it was due to nervousness from active business strain. One night in early November, 1921, he suddenly awakened with an intense pain in the lower abdomen, followed by a temperature of 104°, nausea, and vomiting. The illness lasted 4 days, and was treated by rest in bed and colon irrigations, the latter being continued for 2 months. About a week after the onset of this illness he began to have a burning sensation in the chest. This was independent of meals or other noticeable cause, and gradually intensified and deepened into distinct pain. The attacks of burning and pain would come on suddenly, continue for varying lengths of time, and stop quickly. Various measures of treatment were employed without benefit. The attacks were always brought on by exertion, at first not marked, but in a few weeks so severe that he was unable to walk from his home to his office, about 700 yards, without severe attacks. Three physicians said he had angina pectoris.

The appendix was removed by Dr. Charles Peck, and the patient made a smooth recovery. Microscopic examination showed the usual findings of a chronically diseased organ with subacute addition. After leaving the bed, some slight attacks of burning sensations and slight pain in the chest occurred on exertion, these lasting (gradually getting less) for about 3 months. A year has now transpired since the last of these, and the man has been uninterruptedly well. On many occasions he has tried by vigorous exercise (ice-skating, swimming, very long walks, laborious work on his farm) to test himself, and he has experienced no recurrence of the chest symptoms.

In the intimate relation of chronic appendicitis to colon stasis may be found a probable cause of some of the uncertainty as to the important rôle of the former in pathology and clinical medicine and surgery. Assuming that the effluent toxins of a chronic appendicitis may and do in fact produce a low grade colitis and an almost necessarily consequent pericolitis with adhesions, one can readily understand why the sites of most pronounced pericolitis and stasis should exist at the four sharp turns of the large intestine; the cæcum, hepatic and splenic angles and the sigmoid. Is it not possible that the inevitable tenderness and ballooning at the three last turns of the large intestine have caused many to deflect their attention from the real malefactor, the appendix and the other ileocæcal structures?

It has been observed that this area is almost invariably the site of more or less perintestinal inflammation with a notable tendency to the formation of membraniform adhesions. Such membranous adhesions are very common in apparently healthy dogs. The vermiform appendix in the dog, as is well known, is very large, being virtually an elongation of the cæcum. This abnormally large appendix is usually found to be tightly filled; likewise the ascending and transverse colons are more or less engorged at nearly all times in the healthy dog. Manifold membranous adhesions bind the appendix to the terminal ileum or to the ascending colon. In several of the author's specimens the appendix was sharply angulated at two or three levels by contracting membranes or bands. Often the terminal ileum was found to be enveloped in such membranous adhesions. On microscopic examination of the colon wall opposite these adhesions, complete evidence of chronic colitis was found in each case. The goblet-cells and the lumina of tubules were engorged with mucus. The inter-tubular spaces were infiltrated with round cells and Maximow polyblasts were seen in nearly every field. The small blood vessels were congested.

Colon stasis in the dog is almost constant. Thus it appears that the factors mentioned

before, chronic appendicitis adhesions, membranes and kinks at the cæcum, colitis and stasis are to be observed in nearly every dog. What is the relation between the appendicitis and the stasis?

A great many writers, including Virchow, Gerster, and Pilcher, have expressed the belief that plastic adhesions may form about the colon as the result of a toxæmia having its origin within the lumen of the large intestine. In view of these things it does not seem illogical to say that membranous adhesions about the colon may result from stasis due to chronic appendicitis. I have been impressed by the frequent incidence of a delicate vascular form of pericolonic membrane about the terminal ileum and cæcum. It may be found in some form or degree about the cæcum in nearly every case of chronic appendicitis. That is, a thin vascular extra-peritoneum may be slipped over the underlying serosa in nearly every case of chronic inflammation of the veriform appendix. On microscopic examination this membrane closely resembles the peritoneum of the omentum, and the blood vessels are clearly simply enlarged branches of the ileocolic and artery vein. Thus it represents the congestion zone of an inflammation, the center of which may always be suspected to be and often proven to be in the appendix.

As is well known, a common site of congenital, deforming, defunctionalizing adhesions is about the cæcum. Up to the fourth month of embryonic life, this, like other parts of the large intestine, hangs by an ample mesocolon. Subsequently, however, this mobility becomes lost, owing to the fusion between the outer lamina of the mesocolon and the neighboring mural peritoneum. It should be noted that this fusion takes place in varying degrees. Thus we can account for many irregularities in the attachments of the cæcum and ascending colon. After normal fusion, the mural serosa becomes continuous with the tunica serosa of the ascending colon. The fused layers behind the colon disappear as such, and the posterior wall of the latter no longer has a peritoneal covering.

Instances of retrocæcal and retroperitoneal appendix may be explained rationally by assuming that before fusion occurs the appendix becomes caught between the coalescing peritoneal surfaces of the cæcal mesentery and the abdominal wall. In cæcal descent and torsion, the appendix might readily be arrested at an abnormally high position and between the serous surfaces mentioned. In this manner a true congenital retroperitoneal position of the appendix may be developed which is obviously different from that condition in which, after fusion as described above, has occurred, the appendix is buried under a membrane made by adhesions of small folds about the ileocæcal region to the mural serosa, which adhesions are drawn out as membranes over the caput coli and appendix during normal cæcal torsion. Such a lodgment of the appendix may clearly lead to serious and intractible disturbances of colon function and moreover sectioning would perhaps reveal little or no pathology in the walls of the appendix itself.

It has been contended by some surgeons that the removal of the appendix occasionally brings about a cure of such remote conditions as duodenal and gastric ulcer and it has been suggested that duodenal ulcer and allied conditions are produced by an infection of organisms which grow in the appendix.

While the fact is perhaps established as stated by Mr. Lane that the removal of the appendix is occasionally followed by the disappearance of duodenal ulcer and allied conditions, the foregoing explanation of the phenomenon is, as he states, probably incorrect. It is more rational to believe that the ulcer or as more definitely proven other secondary conditions get well because the appendix which was removed had controlled the effluent in the ileum, and the freeing of this ileal effluent has of necessity relieved the results of its obstruction, of which the duodenal ulcer was one and only one.

The problem of ileal obstruction, either by an ileal kink or by the pressure of an appendix secured to the back of the mesentery, or by both sharing in the production of obstruction of the ileal effluent, is still to be regarded as one of some importance. The cæcum and ileal loop are both distended with fæcal contents and fall into the true pelvis. The end of the ileum hangs over, and its lumen is diminished by the fixed portion of the appendix

secured by its mesentery. It is apparent as noted by Lane that the greater the drop of the cæcum, as it pivots on the fixed appendix, and the greater the dropping and distention of the ileum, the more complete does the obstruction by the appendix tie become. A pertinent matter of interest here being that the appendix causing all of this trouble would perhaps not show any signs of inflammation on microscopic examination.

It may be said that the conditions described above cannot fairly be classified under the head of chronic appendicitis; nevertheless, they are nearly always surgical conditions, are practically always associated with chronic appendicitis, and are often its sequelæ; conspiring to bring about the crisis of an acute attack, but it is of paramount importance that these associated conditions are very often relieved by removal of the appendix if removed early enough, that is before the pain habit, vagotonia, neurasthenia, etc., are firmly established.

If a question is raised as to whether one is ever justified in making a diagnosis of chronic appendicitis in the absence of a history of acute attacks, the question surely must be answered in the affirmative. How often does one find the appendix serving as the tie which secures the cæcum in an abnormal position, with dysfunction and chronic pain in cases giving no history of an acute attack.

No doubt much of the confusion in interpreting pathology in and about the appendix is owing to faulty nomenclature. If we should think and speak, oftener of the malposed, adherent and strangulated appendix and less frequently of active inflammation, no doubt a better understanding would develop. The common denominator, so to speak, is perhaps to be sought in more accurate terminology.

Naturally sensible surgery in chronic appendicitis presupposes intelligent diagnosis and careful exclusion of pyelitis, kidney or ureteral stone, tuberculosis, infections of the reproductive organs, neoplasm, etc., but in making such a differential diagnosis it is surely unwise to attach too much value to the view held by some that in lower right-sided pain the appendix as a causal factor stands very low in point of frequency, since the appendix can give rise to a serious train of abdominal symptoms through malposition, adhesions, etc., without being itself actually the seat of inflammation. After all, the surgeon to be trusted fairly and intelligently to deal with this problem is the one who operates with the support of a carefully made diagnosis. In no field of surgery is the French proverb more applicable: *Un bon operateur serait quelquefois un mauvais chirurgien.*

Cautious surgeons will continue to find after thorough differential diagnosis that chronic appendicitis is a rather common condition. Some years ago Dr. William Mayo was asked how it happened that at his clinic there were found among cases of upper abdominal pathology so high a proportion of gastric and duodenal ulcers. His answer was characteristic, practical and instructive. He said: "We diagnosticate them." Whereas the unscrupulous may continue to remove the appendix needlessly, the discerning will, it is hoped, continue to diagnosticate correctly and prevent calamity by early operation in chronic appendicitis.

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A PRELIMINARY REPORT ON ARTERIAL SYMPATHECTOMY

Including a Report of Two Cases[1]

By E. A. CAMPBELL, M.D., New York
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OUR efforts on the service of Dr. Parker Syms at City Hospital to add to the limited data available on arterial sympathectomy were stimulated by the essay of Dr. Walter Sherwood before the New York Surgical Society on March 28, 1923. The meagerness of our progress in the treatment of many diseases frequently makes us reach out and grasp the straws of possibility in the hope that they may develop into a firmer element of support.

Diseases assigned to disturbance of the nervous control of blood vessels have ever been baffling. In 1920, Leriche reported marked improvement in a case of trophic ulcers of the legs after the performance of a procedure devised and called by him periarterial sympathectomy, which he performed upon both femoral arteries.

In 1921, he made a consolidated report of 64 cases in which he performed sympathectomies for various diseases with only one complete failure. Various other reported cases come to us from the clinics of Bruning and Forster, Veillet, and Jianu. Dr. Sherwood's cases are comprehensive additions to the statistics.

Nerve impulse is carried by efferent nerves to spinal or cerebral centers, there to be transmitted to the terminals of that nerve, for action. As demonstrated by MacKenzie, Cannon, and others, irritation of a nerve in any part of its efferent or afferent course causes an exaggeration of the normal function of that nerve at its efferent terminals. For example, disturbance of a nerve center produces exaggeration of function at its terminus and irritation at the periphera is transmitted to its center and through afferent branches produces the same exaggerated function.

The nerve supply of the blood vessels is obtained from the autonomic or sympathetic system, the filaments of which enter the adventitia of the vessel, are disseminated in a network in this layer and give off innumerable branches perforating into the muscular layers. No nerves are demonstrated where no muscular layer exists. The action of these nerves consists in stimulation of the muscular coat to contraction, thus decreasing the lumen of the vessel and therefore the volume of the blood transmitted to its terminus.

The experiments of Cannon seem to demonstrate that vasodilatation, *per se*, is very weakly, if at all, under direct nervous control, but is accomplished largely by inhibition of vasoconstrictor nerves.

Causative factor is fairly constant in its physical effect. The continued irritation, or irritability, of vasomotor nerves, peripherally, centrally, or along the course of its fibers, will cause a vasoconstriction, and insufficient blood supply eventuating in terminal death of the part. In the accomplishment of this the motor terminals become involved and transmit a painful sensation.

Any or all of these elements have been conjecturally assigned as the causative elements in Raynaud's disease, trophic ulceration of the extremities, some types of arteriosclerosis, frost bite, and similar conditions.

With these points in mind Leriche contended that, if the continuity of nerve supply to an artery was broken, the effect of the irritation (vasoconstriction) by any afferent or efferent part of that nerve would be destroyed. He, therefore, advised the removal of a portion of the adventitia of the main artery leading to the affected part.

The procedure is simple of performance. In the two cases to be quoted, an incision 15 centimeters in length was made beginning about 5 centimeters below Poupart's ligament downward in the direction of the femoral artery. The fascia of Hunter's canal was broken through and the artery freed from its surrounding attachments. The adventitia was incised transversely below the profunda and circumflex branches. A second incision

[1] From the Surgical Service of Dr. Parker Syms. Read before the New York Medico-Surgical Society, May 19, 1923.

through the adventitia was carried downward in the long axis of the vessel for a distance of about 10 centimeters. The adventitia then stripped easily from the vessel. Some small branches were torn away and were closed by a single inverting stitch of silk. The vessel was wiped clear of any adherent portions of the adventitia.

The first effect observed was a constriction of the vessel to about one-half its normal caliber in the denuded portion. This agrees with the statement made by Leriche, who affirms that this constriction is followed in a few hours by dilatation lasting about 4 to 6 weeks.

Our attempt on the first artery was made more tedious by fear of entering the artery and in trying to wipe away instead of incising the adventitia. With the institution of the improved technique, its accomplishment was materially simplified.

An abbreviated report of our two cases is as follows:

CASE 1. Female, white, age 58, admitted to City Hospital, March 29, 1923. She complained chiefly of intense pain in the lower extremities for the past 9 days, increasing in intensity and accompanied by numbness of the toes. She has had pain and soreness in both feet for the past few years. Examination showed œdema of the lower extremities. Both feet were swollen below the ankles. Both feet showed erythema on dorsal and plantar surfaces. All of the toes were almost black, with several large blebs on the plantar surfaces. The feet were very cold. Wassermann was negative. Blood report: urea nitrogen, 13; sugar, 14; creatininel, 3. Electric light treatment instituted and continued for 6 days without relief. During this time toes became entirely gangrenous, and blebs spread to dorsum of foot covering an area of 10 centimeters by 7 centimeters. On April 11, 1923, a bilateral femoral sympathectomy was performed. Day following operation patient reported no pain in feet but some pain in legs. Ten days after operation a sharp line of demarcation appeared in gangrenous area, blebs entirely disappeared, pain in legs diminished. Fifteen days after operation patient complained of small amount of pain in feet. Sixteen days after operation both feet were amputated. The muscular tissue was greyish and unhealthy in appearance. The stumps broke down but showed no evidence of returning gangrene. At the present time, the patient complains of some pain in the stumps but less severe than before sympathectomy was performed.

CASE 2. Female, white, age 51, admitted to City Hospital, March 2, 1923, complaining of great pain in both legs. History of onset 6 years ago after a severe attack of influenza, which was followed by intense pain in the great toe of left foot. The toe became swollen and red and was amputated shortly thereafter. Four years later two toes of left foot and great toe of right foot showed the same changes. These toes were amputated. The wounds did not heal. The pain became very severe, particularly at night. Ten days after admission to City Hospital the middle toe of right foot was amputated. Wassermann was negative. Blood chemistry was negative. A bilateral femoral sympathectomy was performed April 11, 1923. The day following operation the patient reported no relief from pain. Marked diarrhœa. Four days after operation patient reported some relief from pain. Eight days after operation patient reported no pain. Twenty days after operation patient reported no pain.

This patient had become addicted to morphine for the relief of pain. Its removal undoubtedly was the cause of an intractible diarrhœa. The occasional administration of morphine in small doses seemed necessary. Attacks of this complication are still recurrent.

Since all other types of treatment in these conditions have been of little value, such a simple surgical procedure is justifiable. Anything that will relieve the symptomatology, if not the pathology, is worthy of extended trial. These two cases are far from satisfactory. We are not overly enthusiastic as to the results, but are willing and anxious to continue research along this line and largely with the view of increasing the statistical evidence and stimulating further investigation we are making this presentation.

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EXPERIENCE WITH ONE THOUSAND CASES OF ABORTION[1]

By DAVID S. HILLIS, M.D., F.A.C.S., Chicago

THE only adequate method of comparison between the result of the modes of treatment in abortion consists in comparing large series of cases treated actively and conservatively. This paper represents the study of a thousand consecutive abortion cases admitted to the obstetrical service of the Cook County Hospital between July 1, 1920, and March 27, 1923. Through the courtesy of my colleagues in the obstetrical department, I have been privileged to direct the management of these cases.

A general policy of conservatism was carried out. This policy was based on a previous study of 322 cases of septic and non-septic abortion, reported in 1920, in Surgery Gynecology and Obstetrics.

The present series was conducted in such a manner as to secure, if possible, information with reference to the points on which there is a difference of opinion in regard to treatment, namely:

1. The relative value of active or operative and conservative or non-operative therapy as applied (a) to febrile and (b) to afebrile cases.

2. The effectiveness of a five-day period of normal temperature elapsing between the last day of fever and a curettage in febrile patients.

3. The effectiveness of a five-day period of normal temperature elapsing between the day of admission and a curettage in afebrile patients.

4. The frequency of bleeding severe enough to threaten life in abortions under three months.

All cases were alternatively assigned to two general groups upon admission: an active group, and a conservative group. They were treated according to the class into which they fell on a basis of diagnosis: (1) threatened abortion; (2) inevitable abortion; (3) cases with normal temperature; (4) cases with a temperature of 100 degrees or above; and (5) cases with serious hæmorrhage.

Patients with threatened abortion were treated with rest, sedatives, and ice bags to lower abdomen.

Inevitable abortions with normal temperature, assigned to the active list, were curetted on the fifth day after admission, if there was any reason for so doing, provided the temperature remained normal. The reason for this five-day period was that all the patients were considered potentially septic, inasmuch as there was no way of knowing whether or not they had had fever previous to admission. Further, the five-day period of delay was based on the following observations. In 100 of 200 cases of septic abortion observed between the years 1911 and 1916, the uterus was emptied artificially during the febrile period, and as soon as convenient after admission. In the other 100 cases there was no local treatment. The conservatively treated cases had fewer days of fever, a shorter stay in the hospital, fewer complications and a lower mortality.[2] In the period from October, 1918, to April, 1919, a three-day period was tried. In not a few cases there was an alarming postoperative rise in temperature and the stay in the hospital was prolonged.

In the present series if the patients with inevitable abortion fell on the conservative list, they were not curetted unless bleeding threatened life, or bloody discharge persisted more than 10 days. No patient with a temperature of 100 degrees or above was curetted unless hæmorrhage threatened life. If such cases were assigned to the active list and bleeding indicated that the uterus was not emptied, they were curetted after the temperature had reached normal and then remained afebrile for 5 days. If they fell on the conservative list they were only curetted if bleeding persisted more than 10 days, and the temperature had remained normal. If hæmorrhage occurred severe enough to endanger the patient's life, the uterus was emptied, regardless of temperature, and in such a man-

[2] Treatment of abortion. Surg., Gynec., & Obst., 1920, xxxi, 605.

[1] Read before the Chicago Gynecological Society, June 15, 1923. (For discussion, see p. 131.)

TABLE I.—PARITY

	Para															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total
Active list	89	110	77	55	55	37	22	15	9	12	5	1	2	0	1	490
Conservative list	98	105	75	69	47	31	19	20	14	4	4	4	0	0	0	490
Total (20 undetermined)	187	215	152	124	102	68	41	35	23	16	9	5	2	0	1	980

TABLE II.—PERIOD OF GESTATION

	Month of Pregnancy						
	1–2	2–3	3–4	4–5	5–6	6–7	Total
Active list	192	161	77	26	18	5	479
Conservative list	143	137	77	47	24	11	439
Total (82 undetermined)	335	298	154	73	42	16	918+82=1000

TABLE III.—ETIOLOGY OF ABORTION

	Spontaneous	Criminal or self-induced	Trauma or accident	Total
Active list	369	124	6	499
Conservative list	394	100	7	501
Total	763	224	13	1000

N.B. Of the total number of cases were noted 51 retroversions of various degrees; two pyosalpinges; one fibroid uterus; one double vagina and cervix.

ner as to cause the least possible traumatism to the uterus and surrounding tissues. When emptying the uterus in the presence of fever, the use of the curette was avoided if possible. Ovum forceps were used to remove the placental fragments which were often found protruding through the soft dilated cervix. Cases with dangerous hæmorrhage are rare in which the cervix is not sufficiently dilated to admit the ovum forceps. Curettage in afebrile cases was done with the finger, ovum forceps, or curette, depending upon the cervical dilatation present.

Rectal examination was done as routine in all cases.

The parity of the cases is indicated by Table 1. The distribution is quite wide and no definite conclusions can be drawn from these figures even though abortion seems to be more frequent in women who have borne no children and in primiparæ.

Abortion was more common in 633 of 918 patients between the first and third months of gestation (Table II).

Table III shows that of a thousand cases, 224, or 22 per cent, were criminal or self-induced. In 763, or 76 per cent, the abortion was apparently spontaneous and in 55, or 5 per cent, there was recognized pelvic pathology. The importance of these figures with reference to septic abortion is brought home to us when we recognize that it is clear that a febrile abortion caused by criminal attempts to expel the fetus is something entirely different from the clinical standpoint from a febrile abortion resulting from the retention of placental remains or a macerated fetus.

There were 744 incomplete abortions (77.2 per cent), as shown in Table IV.

Table V shows 297 cases of the series admitted with a temperature above 100° F, 29.7 per cent.

The average days of temperature for curetted and non-curetted patients was slightly

TABLE IV.—TYPE OF ABORTION

	Complete	Incomplete	Threatened	Total
Active list	67	383	39	489
Conservative list	75	361	38	474
Total	142	744	77	963
Percentage	14.8	77.2	7.9	..

TABLE V.—TEMPERATURE ON ADMISSION

	To 98.8°F.	98.8 to 100°F.	100° F. or above	Total
Active list	259	94	146	499
Conservative list	271	70	151	501
Total	530	173	297	1000
Percentage	52.3	17.3	29.7	..

TABLE VI.—TOTAL DAYS OF TEMPERATURE

	Number of cases	Total days of temp.	Average	Days before operation	Average	Days after operation	Average days
Curetted	241	369	1.53	223	0.92	146	0.6
Non-curetted	759	1298	1.71	..	..	..	..
Total	1000	1667	1.66	223	0.92	146	0.6

TABLE VII.—EFFECT OF CURETTAGE ON TEMPERATURE (241 CASES)

Cases with fever before operation	A	B	C	Cases without fever before operation	A	B	C
Number	12	59	71		50	120	170
Number continuing or developing fever after operation	7	23	30		13	6	19
Percentage	58.3	38.9	42.2		26	5	11.2
Total number days	26	75	101		18	27	45
Average number days	3.7	3.2	3.37		1.38	4.5	2.36
Number in which fever stopped after curettage	5	36	41	Cases in which no fever developed	37	114	151
Percentage	41.7	61.0	57.7		74	95	88.8

Column A represents patients curetted before they were in the hospital 5 days.
Column B represents patients curetted after a five-day rest period.
Column C represents all curetted patients.

longer for the latter—1.71 days in contrast to 1.53 days for the curetted (Table VI). It is to be recalled that the curetted patients include those on the active and conservative lists, who had alarming hæmorrhage or who were not complete abortions after the five or ten-day period previously described. Further, of the patients who had to be curetted, the average febrile period before operation was 0.92 day and but 0.60 day after operation. *Considering the entire series of a thousand cases, it seems safe to conclude that curettage did not lengthen the average total febrile period.* A more detailed analysis of the effect of curettage on temperature appears in Table VII.

Of a total of 241 curetted patients, 71 (29.4 per cent) had fever before operation, and 170 (70.5 per cent) were afebrile. Twelve of the febrile and fifty of the afebrile patients, or a total of 62 (25.7 per cent), had such alarming hæmorrhage that curettage was carried out before the end of the five-day period. In both instances where the five-day period could not be observed, the percentage developing or continuing fever after operation (febrile group 58.3 per cent and afebrile group 26 per cent) was considerably higher than the percentage who had the advantage of a five-day rest period (febrile group 38.9 per cent and afebrile group 5 per cent). However, it is interesting to note that the afebrile patients who had the five-day rest period had a greater average number of days of fever (4.5 days) after operation than those who were operated on before the five-day limit (1.38 days). Of the afebrile group 74 per cent of the emergency curettage patients remained fever-free, while 95 per cent of those with a five-day rest period remained afebrile.

Table VIII indicates that when the patients were safely curetted, the average days of red lochia were 1.48 days after the curettage. Among the non-curetted cases the average days of red lochia were 3.9 days.

The number of days in the hospital was shorter among the non-curetted cases, but 179 of 241 curetted patients were kept at least 5 days before being operated upon. Had this rest period been eliminated, the duration of stay in the hospital would have been shorter for the curetted patients.

Table X indicates the type of treatment carried out in the series and is self-explanatory.

The gross mortality of the series was 2 per cent (20 of 1000). There were 297 cases ad-

TABLE VIII.—LOCHIA RUBRA

	Curetted	Not curetted
Number	241	759
Total days	1684	2960
Average days	7.	3.9
Days after operation	357	..
Average days	1.48	..

TABLE IX.—DAYS IN HOSPITAL

	Curetted	Not curetted
Number	241	759
Total days	2481	5913
Average	10.3	7.79

TABLE X.—TYPE OF TREATMENT

Active —499	Curetted—189	
	Not-curetted —310	192—afebrile but empty by 5th day. 34—not curetted because of sepsis. 22—threatened abortion cases. 62—febrile but empty by 5th day.
Conservative —501	Curetted—52; because of alarming hæmorrhage or persistent bleeding.	
	Not-curetted—449.	

TABLE XI.—MORTALITY

	Curetted cases 241	Not curetted cases 759
Deaths	3	17
Percentage mortality	1.24	2.24

mitted with a temperature of 100° or above. Twenty of these died. No patient died among those admitted with a temperature below 100°. There were 12 febrile patients curetted with three deaths and 229 afebrile patients curetted with no mortality. Of the 20 fatal cases, 14 showed unmistakable signs of extension of the infection beyond the uterus at the time of entrance. Nine had a general peritonitis; one a local peritonitis; three a septicæmia; and one a pneumonia. In these cases the abortion itself had become of secondary importance and the treatment concerned principally the treatment of the well-defined complications resulting from the abortion. In considering the results of a given plan of treatment of abortions, these cases might properly be excluded. Of the remaining 6 cases, the uterus was emptied in the hospital in 3 on account of hæmorrhage (2 of these were criminal abortions); 1 was curetted before entrance; 2 were not curetted in the hospital and denied interference before admission. In only one case among those who died was it known that the patient was not subjected to some kind of intra-uterine manipulation either outside or in the hospital. Sixteen of the 20 fatal cases were known to have been criminal abortions induced by a physician, midwife, or by the patient herself. The two cases which died and were treated expectantly, denied interference and no evidence to the contrary was found. One case moribund could give no history and doubtful evidence of abortion was found postmortem.

Only three deaths occurred among patients in which the abortion *may* have been of spontaneous origin. In only one fatal case was the abortion *known not* to have been criminally induced. This patient died 5 days following an extensive operation for ventral hernia and one day after the curettage. This death was due to hæmorrhage and shock and not to sepsis.

Most of the deaths were in patients who were admitted in such a condition that it was evident the septic process had extended widely beyond the uterus, and were therefore not curetted. For this reason the percentage mortality is 1 per cent greater in the cases with no local treatment. These figures in themselves on their face would seem to indicate that active treatment furnishes the best prognosis from every standpoint. Such a conclusion is seen to be false when the list of fatal cases is studied, 16 of which were criminal abortions.

CONCLUSIONS

The study of a thousand cases of abortion seems to indicate that—

1. Conservative treatment of abortion in febrile cases gives better results than active therapy.

2. Febrile patients who have a five-day afebrile period have a greater tendency to continue a normal temperature after curettage than those who are operated upon before the end of this period.

3. Afebrile patients with a five-day observation period have a greater tendency to

remain with a normal temperature than do those who are curetted before the end of this rest period.

4. Approximately 6.2 per cent of patients must be emptied because of alarming hæmorrhage.

5. A plan of procedure which embodies a conservative rest period of 5 days' normal temperature for febrile and afebrile patients and results in as low a mortality as quoted in this paper seems to be a rational method for the treatment of abortion.

CYSTIN NEPHROLITHIASIS

Report of Case with Roentgenographic Demonstration of Disintegration of Stone by Alkalinization

By A. J. CROWELL, M.D., F.A.C.S., Charlotte, North Carolina

CYSTIN nephrolithiasis is a rare but a very interesting condition. It is especially interesting, first, because of the uncertainty of its etiology, second, because of the probable infrequent recognition of the disease, and third, because of the excellent results which may be obtained by proper diet and internal medication. The disease has been known for more than one hundred years. It was first thought to be due to anomalous metabolism similar to that occurring in gout and diabetes. Link was able, in 1912, to collect from the literature only 146 cases. To our knowledge, we have had only one case at our Clinic. We probably have had others but did not recognize the condition.

A great many theories have been presented and considerable laboratory work done in connection with clinical observations in order to arrive at a satisfactory explanation of cystinuria, but thus far we are far from it. One of the earliest beliefs was that there was an abnormal catabolism of protein in the intestinal tract with a consequent production of cystin, so much in excess that it could not be disposed of and was excreted unchanged in the urine. Blum disposed of this theory by his experimental proof that large amounts of cystin when given by the mouth even to the limit of toxicity could be oxidized in the body without the production of cystinuria.

Thiele found that the amount of cystin excreted was practically independent of the diet. The patient was able to break up cystin administered by the mouth, even though it was cystin previously excreted by him.

The modern view of the production of cystin in the body is that it is due to some error in metabolism. This error involves some of the end decomposition products of protein of which cystin is the most important. The oxidization of some of the other amino-acids and the diamines may also be inhibited. There is a varying extent of error as regards the number of protein fractions involved.

Alsburg and Folin, as a result of their study of the subject, believe that the cystin excreted is proportionate to the protein intake. Reduction of protein intake reduces the amount of cystin in the urine but does not get rid of it altogether. Their observations lead them to believe that alkali does not act as a solvent but influence metabolism so that cystin is not formed and excreted as such.

Stadthagen and Brieger believe it an infection. The frequent coincidence of cystinuria and constipation would favor this theory. Wasserthal pointed out that the frequent coincidence of articular rheumatism and cystinuria was significant for this theory.

Moreigne concluded that cystinuria is a condition of nutrition, caused by partial arrest of oxidation. He says the infectious theory is not comparable with the fact that cystinuria lasts for a life time.

Ackerman and Kutscher state that it is a generally accepted fact now that the cause of cystinuria is a suppression of amino-acid catabolism.

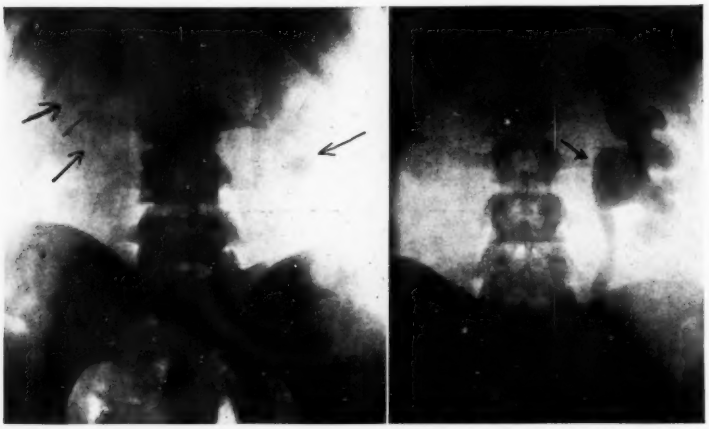

Fig. 1 (at left). Roentgenogram showing 3 stones in left kidney pelvis and one in the right. January 5, 1922.
Fig. 2. Right ureteropyelogram showing hydronephrosis. Solution covers stone. January 14, 1922.

Wolfe and Shaffer say that cystin in high protein feeding is largely of exogenous origin, but a part is probably not derived from food protein. To what extent strictly endogenous processes play a part in its formation is impossible to say.

DIAGNOSIS

The presence of a stone in the bladder or a shadow in the kidney, associated with cystin crystals in the urine or its presence in solution in the urine, suggests the diagnosis of cystin nephrolithiasis. Absence of cystin from the urine chemically or microscopically does not mean that the stones are not cystin. It occasionally disappears from the urine temporarily. Many observers believe it will return regardless of treatment. Some think it is impossible to free the urine entirely from it. Alsburg and Folin hold to this theory. Bloody urine associated with pain in the back may mean cystinuria even though there be no shadows in the kidney region. The question can be cleared up by urinalysis. Many cases of kidney colic and back pains may be produced by the passage of cystin crystals.

PROGNOSIS

The prognosis of cystin nephrolithiasis is considered good as to life but not good with respect to cure. Recurrence of cystin stone following nephrolithotomy has been considered almost certain but our experience with the condition leads us to believe that we may not only prevent recurrence but also bring about disintegration by proper management and treatment. When these stones do form, the usual sequelæ of stone-formation follow, the resulting pathology being dependent upon the location and size of the stones.

Before taking up the treatment of this condition, I wish to report the following case which came under our care, January 1, 1922.

Case No. 6417, female, age 27, single. The parents are living and in good health. Paternal grandfather had kidney colic when a young man but lived to be over 80 years of age. One paternal aunt died of "kidney trouble." One sister, 37 years of age, had a right nephrectomy performed 4 years ago on account of a large stone and infected kidney. She now has two stones in the the left kidney. With these exceptions the family history is negative and the members were generally long-lived.

Patient has suffered more or less all her life with some frequency of urination and pain in the back. She passed what she termed a "shower of stones"—20 to 25—in 1913 but never suffered with colic until 2 days previous to coming under our care. A large stone was removed from the right kidney by Dr. Shipley, of Baltimore, June, 1921. At this time the roentgenographs showed two small and one large stone in the left kidney. These were removed by py-

Fig. 3. March 10, 1922.

Fig. 4. May 4, 1922.

Fig. 5. Stones slightly reduced in size. April 7, 1922.

elotomy, November 24, 1921. At the time of this second operation, the roentgenographic examination revealed a recurrence of stone in the right kidney pelvis. Dr. Shipley writes me that these stones were analyzed in the University Laboratory and found to be composed of cystin. Chemical analysis of the urine also showed the presence of cystin.

Present illness. The patient came to our Clinic, January 1, 1922. She had been suffering with nephritic colic for 2 days and was brought in on a, stretcher. Her temperature was 103 degrees F., pulse 130, tongue dry, and patient was very toxic. In fact, she was in a semi-comatous condition and in every respect she appeared to be a very sick woman. Cystoscopy showed the left ureteral opening normal in appearance and functioning regularly. A large stone was seen in the right uretero-vesical opening. An effort was made to dislodge it with the beak of the cystoscope. Failing in this, a No. 9 ureteral catheter was finally passed by the stone and an abundance of pus obtained. The catheter was fastened in and retained for 36 hours, during which time the pelvis was lavaged every 3 hours with saline solution. The temperature rapidly dropped, the extremely parched tongue became moist, the delirium disappeared, and the patient was much more comfortable in a very short time. As a result of ureteral dilatation the large stone observed in the ureteral opening was voided within 12 hours after the retention catheter was removed. This was analyzed and found to consist entirely of cystin.

Five days later the phenolsulphonephthalein, after intravenous injection, appeared in the urine from the right kidney in 3.5 minutes and the output in 15 minutes was 5.25 per cent with a concentration of 0.19 per cent to each milliter. The phthalein appeared in 3 minutes from the left and the output in 15 minutes was 5.5 per cent or .38 per cent to each milliter of urine, thus showing the function better on the left side. This, in connection with a few granular tube casts and a trace of albumin, would indicate a pyelonephritis. Roentgenogram showed a large stone in the right kidney and 3 smaller ones in the left. Leucocyte count was 12,050. Wassermann reaction was negative. Pelvic lavage with mercurochrome and saline solution was given every second and third day for about 45 days. During this time her urine was kept alkaline by taking sodium bicarbonate. The infection gradually disappeared and the kidney function improved. She went home with instructions to keep her urine alkaline by taking bicarbonate of soda and report weekly for pelvic lavage. The stones shortly began to reduce in size and continued until they disappeared entirely from the kidneys 9 months thereafter. In addition to the disintegration of the stones the infection cleared up and the urine is free from cystin. The patient is now 35 pounds heavier than when she first came under our care.

In our case the kidneys have been freed from stones and the urine from cystin by keeping the urine alkaline. This has been accomplished without rigid limitation of protein in the diet. She is still taking soda and has not been under observation sufficiently long to know the ultimate results.

TREATMENT

Since cystin is soluble in alkaline solutions, a very important part of the treatment is to render the urine alkaline and keep it so. The lower the protein intake, the easier this will be accomplished. Sodium bicarbonate is about the best for this purpose.

Pelvic lavage with an alkaline antiseptic solution should be used and certainly if we have pelvic infection. This can be done

Fig. 6.

Fig. 6. Stones have disappeared from left kidney and further reduction in size of the stone in the right kidney. September 27, 1922.

Fig. 7.

Fig. 7. Showing only a small shadow on the right side. No shadows in left kidney. November 9, 1922.

Fig. 8.

Fig. 8. Showing complete disappearance of all stones. January 16, 1923. Subsequent pictures show no shadows in either kidney. These negative findings obtained to June, 1923.

every day but every second or third day is better. The solution should be warm and an amount just below the pelvic capacity used and retained 5 to 15 minutes, this depending upon the amount of reaction produced by the drug. This lavage should be followed by one with saline solution. We used in our case mercurochrome and saline solutions every second or third day. Mercurochrome is alkaline as well as antiseptic. It is also very penetrating. We believe the lavage with these alkaline solutions assisted in the disintegration of the stones in our case and hope the plan may be tested further. Of course, the whole problem is unsolved and will be until its etiology is more definitely settled.

Surgery has usually been considered the proper treatment. This has been very unsatisfactory on account of the great frequency with which the stones recur. In so far as I have been able to ascertain, recurrence has been the rule. Nearly all agree that the diet should have a low protein content. Every precaution should be taken to prevent infection. All instrumentation should be avoided when there is no infection until a careful microscopical and chemical analysis has been made of the urine to see if there be cystin crystals in it or cystin in solution. Certainly no ureter catheterization should be done if a non-operative plan of treatment is to be pursued unless it be with the view of assisting stone disintegration by the use of alkalies in pelvic lavage.

CONCLUSIONS

1. The etiology of the disease is still unsolved but is probably due to faulty metabolism.

2. The urine should be examined for cystin in all cases of kidney colic and back pains whether or not they are accompanied with kidney X-ray shadows.

3. If the stone is associated with cystinuria, disintegration should be attempted by the internal administration of alkalies, pelvic lavage with alkaline solutions, and limitation of protein diet.

I am greatly indebted to my associates Drs. Thompson, Todd, McKay, and Squires for valuable suggestions and assistance in the management of this case as well as to Dr. E. A. Livingston who referred the case to us. It was at the suggestion of our clinical pathologist, Dr. Todd, that the plan of treatment with alkalies be tried with a view to rendering the urine alkaline and therefore a solvent of cystin.

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THE COEXISTENCE OF CHOLECYSTITIS AND DUODENAL ULCER IN THE SAME CASE

With the Report of Several Recent Cases

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SUPPOSING the septic theory of duodenal ulcer to be correct, then the coexistence of cholecystitis and duodenal or gastric ulcer stands upon the same foundation as that existing between appendicitis and inflammation of the gall bladder.

Postmortem findings, as quoted by Judd, go to prove that a healed duodenal ulcer is frequently found in patients who give no past history of digestive disturbances. Just because a patient has gall stones does not prove that they are the cause of the patient's symptoms. Every abdominal surgeon recognizes the fact that slumbering gall stones may exist for years without producing any symptoms.

The following five cases occurring in the past few months seem worth recording for the purpose of drawing attention to the combination of cholecystitis and duodenal ulcer. While no formal record has been found in the literature for the past few years, we find in the report of a clinical lecture delivered by Ochsner that he has noted on several occasions the occurrence of these two diseased conditions in the same patient.

Case 1. Patient with a definite duodenal ulcer history; gall bladder removed by another surgeon one year before without relief of symptoms.

Mr. P. E. J., age 45, patient of Dr. H. Perrin. Eight years ago patient began to have symptoms of gastric disturbances, 1 or 2 hours after eating, with vomiting. Later he had attacks with food relief and much gas, coming every 3 or 4 months and lasting 10 days or more. In November, 1921, he was operated upon, at Eau Claire, Wisconsin, for cholecystitis and his gall bladder was removed, bringing no relief.

Present illness. Symptoms of gastric distress have come on gradually. One month ago he vomited and became afraid to eat on account of marked discomfort.

Physical examination. Tender spot is present over the pylorus on fluoroscopic examination. X-ray plates showed a perforated base of an old duodenal ulcer with retained barium for many hours after a meal.

Operation. September 14, 1922. St. Luke's Hospital, ether anæsthesia. On opening the abdomen, adhesions were found between the liver and the anterior abdominal wall. The gall bladder had been removed 14 months before. A chronic indurated ulcer of the posterior wall of the duodenum was found, with no evidence of pyloroplasty or excision at the time of the previous operation. A short loop posterior gastro-enterostomy was done and the patient made an uninterrupted recovery, and reported to us 2 months later that his digestion was perfect and that he had gained 10 pounds.

Case 2. Chronic obstructing duodenal ulcer and chronic cholecystitis with one large stone.

Mrs. T. B. O'B., age 58, married. The family history is negative. Patient has had hay fever for the past 27 years; otherwise has always been well until the present illness. Menopause 5 years ago.

Present illness. In April, 1921, patient began to have what she describes as attacks of "stomach trouble." The first attack came on suddenly with a chill, severe nausea and vomiting of a more or less tasteless watery fluid. The vomiting continued almost constantly for 6 weeks without any jaundice or pain, but she became weak from lack of nourishment. In the fall of 1921 she had a similar attack but of shorter duration. During the following year there were several such attacks, always with nausea and vomiting, but no pain. In September, 1922, the attacks became very severe and she vomited continuously and became hysterical. As before there was vomiting without pain or jaundice. Vomitus consisted only of a watery fluid. Between these various attacks she has had a good appetite and has eaten everything because, as she says, food apparently was not a factor in her attacks. She first consulted us on October 25, 1922, in a quiescent period, and was placed in the hospital under observation and remained for 4 days. X-rays of the gall bladder, kidneys, and ureters were negative as were all the routine laboratory findings. She was sent home with instructions to report at the office for further observation, but nothing was heard from her until November 22, 1922. During this interval there had been three attacks of chills, nausea, and vomiting of about 3 days' duration each. During these attacks there was no pain but a feeling of tenderness midway between the shoulder blades.

Physical examination. A rather obese individual with evident recent loss of subcutaneous fat. Except for a complete procidentia the findings were negative. Blood pressure 140–80. Urine negative. Ewald meal: free hydrochloric acid, 58; total acidity, 94; microscopic and chemical examination negative. Fluoroscopic examination of the stomach showed a

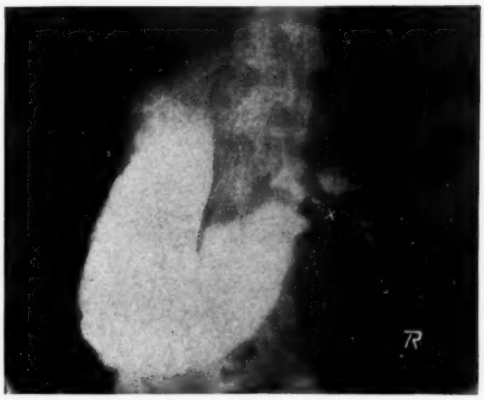

Fig. 1, Case 1. Perforating duodenal ulcer seen at *X*. Barium remained in this pocket for 24 hours after barium meal.

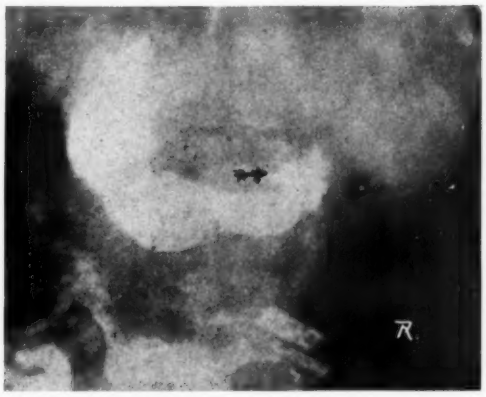

Fig. 2, Case 2. Ulcer crater shown by arrow. Gall stone not seen in picture because it is a transparent cholesterin stone.

definite constant filling defect in the duodenal cap verified by plate studies. A diagnosis of duodenal ulcer was made.

Progress. The patient was put to bed in the hospital and placed on a rigid diet of 800 cubic centimeters of milk in 24 hours for 6 days, with feedings on the even hour and alkaline powders on the half hour. She complained constantly of a feeling as if there was a lump under the manubrium at the level of the third rib, and although she had no attacks she apparently did not improve and on December 9, 1922, an operation was advised.

Operation. Ether anæsthesia was given and on opening the abdomen dense adhesions were noted in the gall-bladder region. The gall bladder was thickened and indurated and contained one large stone. Cholecystectomy was performed. There was a marked induration and thickening along the posterior wall of the duodenum from an old chronic ulcer. This induration extended just beyond the pyloric vein and produced a partial obstruction. A posterior gastro-enterostomy, using a short loop, was performed and a drain placed at the stump of the cystic duct, and the abdomen closed. The operative diagnosis was cholelithiasis and duodenal ulcer.

Postoperative. Convalescence was uneventful. The patient lost the "lump" on the second day and says she has not felt so well for years.

On going over the entire past history after the operation the patient recalled that about 11 years ago she had had a short period in which she was troubled with indigestion and gnawing in the stomach just before meal time, but that it soon passed away.

CASE 3. Patient with definite digestive attacks occurring every few months for the past 5 years.

Mr. A. B., age 30, single. Family history is negative. Patient had scarlet fever in 1900, diphtheria in 1910, no sequelæ. He had a ruptured appendix in 1913, which was drained and the wound not closed.

Present illness. During 1918 patient had two or three attacks of what he describes as "tightness in the chest" lasting about 2 or 3 hours. These attacks came on at various times and had no apparent relation to meals. During 1919 he felt perfectly well. Early in 1920 there were several attacks similar to those in 1918. Beginning in November, 1921, the attacks became more and more frequent and there was a pressure sense in the upper abdomen but no pain or nausea. In February, 1922, the attacks became severe, occurring every 10 days, with pain radiating from the upper abdomen to both shoulder blades. The duration of the attacks never exceeded 2 hours. He vomited only once and that with one of the last attacks. Vomitus was watery and very sour. Stools have been loose all the time since the beginning of the attacks in 1918.

Physical examination. A well-developed and nourished individual. Abdomen showed a weak abdominal scar in the right lower quadrant with a slight hernia in the upper angle. There was tenderness on deep pressure in the mid-epigastrium. The balance of the examination was negative. Blood pressure 125–75. Urine, blood, and stools, were negative. X-ray plates showed a large cluster of gall stones. A diagnosis of cholelithiasis was made and an operation advised.

Operation, May 16, 1922. On opening the abdomen there were found marked adhesions in the region of the gall bladder and the gall bladder was firmly adherent to the under surface of the liver. Cholecystectomy was performed. The gall bladder contained eight stones the size of hazelnuts and thirty smaller stones. Convalescence was uneventful. There is no record of exploration of the stomach or duodenum. Operative diagnosis: cholelithiasis.

Subsequent history. On June 13, 1922, one month after operation, patient reports a return of distress in the mid epigastrium about as before his opera-

Fig. 3, Case 3. A cluster of gall stones probably of the slumbering variety. Duodenal ulcer probably present but not proven.

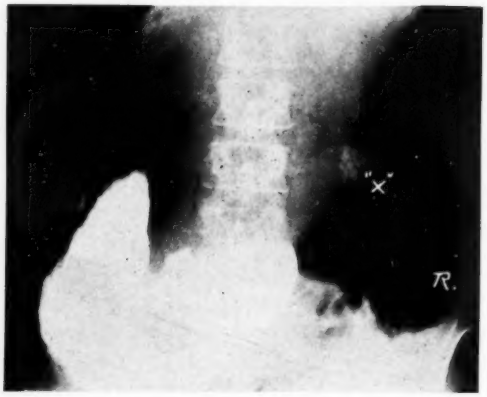

Fig. 4, Case 4. Gall stones at *X*. Pyloric end of stomach ragged and irregular with no duodenal cap. Almost complete retention of barium meal given 24 hours previously.

tion. There is a soreness a little to the left of the median line which is noticed especially just before breakfast. Fifteen minutes before eating there is only a sensation of a "lump" in the stomach. This gradually wears away until just before noon when he says he feels hunger pain, and this pain is present again just before dinner in the evening. Bowels are still loose.

Physical examination. A little tenderness is present on deep palpation in the mid-epigastrium. Otherwise the examination is negative. Urine negative, no white count made, stools not examined. Ewald meal shows free hydrochloric acid, 40; total acidity, 48. Fluoroscopic examination shows an apparently normal stomach. Duodenal cap pulled posterior and rather fixed, probably adhesions, no definite filling defect although the cap is not symmetrical. Plates do not show the cap very well, probably because of its posterior position.

Patient was placed on a modified Sippy diet and reports that he is getting only slight relief.

CASE 4. Combination of cholecystitis and cholelithiasis with many stones and an indurated duodenal ulcer with complete inflammatory obstruction of the pylorus. Patient slowly starving to death.

Mrs. J. H. S., age 61, widow. The past history is negative. Menopause 5 years ago.

Present illness. In the winter of 1921–1922 patient had a fall while getting out of an automobile and was sick in bed 3 months during which time she was on a milk diet. Shortly after the accident she began to vomit and on one occasion vomited a small amount of blood, and had a dull pain in the epigastrium. The vomiting continued off and on for some weeks and then stopped. No bloody or tarry stools had been noted. During the summer of 1922 she felt perfectly well but in the fall began to be constipated and had occasional vomiting spells. Once in September, 1922, vomitus contained a small amount of blood. A local doctor washed out her stomach a good many times and she took some white powders. Since September she has had a constant dull pain in the epigastric region, apparently without relation to meals. She has lost about 20 pounds in weight since September. She comes in now because of stomach distress, persistent vomiting, and a palpable mass in the pyloric region which she has noticed for at least 6 weeks.

Physical examination. A poorly nourished woman with a dry skin and drawn face. Heart and lungs negative. Abdomen sunken, spasm in right upper quadrant with a distinct mass about the size of an orange, which is slightly tender and slightly movable. X-ray shows a large, low stomach, lower pole at symphysis but otherwise normal. Duodenal bulb is irregular in outline and very irregular in its course. Apparently it is an extrinsic mass which is slightly movable but does not descend during inspiration and presses on the duodenum. Plates also show multiple gall stones. Twenty-four hour fluoroscopic examination shows almost complete retention of the barium meal. Ewald meal, 1000 cubic centimeter; free hydrochloric acid, 42; total acidity, 73; lactic acid, 0; blood, 0.

Operation. Entirely under local anæsthesia and without any pain. On opening the abdomen there were found marked adhesions between the gall bladder and duodenum and a large, inflammatory mass in the duodenum from an old indurated ulcer. The gall bladder was thickened and full of stones. A posterior gastro-enterostomy was performed. The gall bladder was full of stones but was not disturbed. A report on a piece of tissue removed for microscopical examination was as follows: "Tissue lymph node showing hyperplastic changes as would be expected in a node draining a field of chronic inflammation." Temperature never over 99 degrees while at hospital, except on the day of admission when it

was 100 degrees. The patient gained 30 pounds in the hospital and made a perfect recovery.

CASE 5. Cholelithiasis with a healed duodenal ulcer.

Miss H. S., age 50, patient of Dr. J. McLaren. When patient was 28 years old she had a sudden hæmorrhage from the bowels and for the next 6 months had a marked duodenal ulcer history but no symptoms of duodenal ulcer since that time.

The present illness. Dates back 9 years at which time she had a typical gall-bladder attack with very severe pain lasting 14 hours. Later had a second attack which was also very severe. The third attack was 3 months ago, lasting all night, and followed by jaundice.

Operation. Showed a healed duodenal ulcer with no induration or obstruction; chronic cholecystitis and a small shrunken thickened gall bladder with one stone the size of a hen's egg and three smaller stones. There was an enlarged fibroid uterus. The gall bladder was removed and nothing was done to the duodenal ulcer or to the fibroid uterus. The patient made a good recovery.

CONCLUSION

It is our conclusion that when operating upon a patient suffering with gall-bladder disease, especially in the presence of gall stones, we should make it a point also to examine the stomach and duodenum carefully to make sure that a duodenal or gastric ulcer does not exist at the same time.

HÆMOLYTIC STREPTOCOCCI AND THEIR RELATION TO PREGNANCY AND THE PUERPERIUM[1]

By A. E. KANTER, M.D., and I. PILOT, M.D., Chicago
From the Out-Patient Obstetrical Department of the Presbyterian Hospital and from the Department of Pathology and Bacteriology, University of Illinois, College of Medicine

WE are well aware of the vast amount of material which has been written on the subject of the vaginal flora in relation to the production of puerperal sepsis. A review of the literature, however, shows no uniformity or consistency in the methods of study in regard to media used, methods of obtaining cultures, and interpretation of findings. Another striking feature is that no special emphasis was made to differentiate the streptococucs hæmolyticus from the other types of the streptococcus. For this reason we feel that a study of the puerperium, especially with the reference to the streptococcus hæmolyticus, would be of value.

Obstetricians agree that external influences have a very important relation to the production of puerperal sepsis There is, however, quite a large number of instances where, as far as it is possible to determine, no external influences have been at play. This so-called auto-infection theory as a cause of puerperal sepsis has been a matter of contention for many years and is still unsettled. It was thought that a combined clinical and bacteriological study of pregnancy might give some light on this subject.

The following tabulation gives an idea of the frequency with which streptococci have been demonstrated in the vaginal secretion by certain investigators:

In 4 per cent of cases by Burckhardt (3).
In 27 per cent of cases by Walthard (24).
In 15 per cent of cases by Winter (23).
In 20 per cent of cases by Williams (21).
In 8.5 per cent of cases by Burguburn (4).
In 4.0 per cent of cases by Doederlein (7).
In 4.0 per cent of cases by Steffeck (17).
In 25.0 per cent of cases by Vahle (19).
In 13.0 per cent of cases by Kottmann (11).
In 30.0 per cent of cases by Stolz (18).

In this tabulation no distinct effort was made to separate the streptococcus hæmolyticus from other organisms of the same group.

During pregnancy the hæmolytic streptococcus was found in

2.5 per cent of cases by Goenner (9),
50.0 per cent of cases by Bohne (2),
7.5 per cent of cases by Bergholin (1),
14.0 per cent of cases by Jotten (10).

During the puerperium streptococci were found—

In 30 to 50 per cent of women examined by Bumm and Sigwart (5);

In 20 per cent of women examined by Lea and Sidebotham (13);

In 8 per cent of women examined by Williams (21).

A great disparity is shown in the results obtained. Many explanations have been given for this variance.

Kuester (12), in 1913, divided the flora into two groups: the first group included those bacteria found between the introitus and the hymen, and the second group those found between the hymen and the external os. He stated that more streptococci were found in the first group. Doederlein (7) stated that the vaginal secretion might occur in one of two forms, which he designates as normal and pathological. He maintained that no streptococci could be found in the normal secretion while they could be found in 10 per cent of the pathological secretions. J. W. Williams (22) held that the number of streptococci found depended upon the manner in which the cultures were made. Fewer streptococci would be found when the Menge tube was used, and when a speculum was used he claimed that the organisms from the vulva were pushed into the vagina and thus contaminated it. Fricke (8), in 1914, showed that the results obtained were the same irrespective of whether the secretion was obtained by means of a Menge tube or speculum. She also showed that streptococci could be cultured in 75 per cent of cases from vulva and 55 per cent of cases from vagina, and that personal cleanliness had a great deal to do with the finding of organisms on the vulva.

[1] Read before the Chicago Gynecological Society, June 15, 1923. (For discussion see page 130.)

Assuming now that a standard method of obtaining material for study was developed and that the results obtained by workers were uniform, there still would remain a difficult problem, namely, that of determining the pathogenicity of the organism.

Schottmueller (16) brought forth the idea that all hæmolytic streptococci are virulent. This idea is not tenable at the present time. Other efforts have been made to detect specific differences between the varieties of streptococci according to the length of their chain, their mode of growth, and staining reaction. According to Scheib (15) it is impossible to distinguish between streptococci existing as saprophytes in the lochial discharge and those causing puerperal infection.

MATERIAL FOR STUDY

Ninety-six women who were under the care of the outpatient department of the Presbyterian Hospital and Central Free Dispensary were used for the bacteriological study. There were twenty-five para-I, twenty-seven para-II, nineteen para-III, three para-IV, three para-V, three para-VI, one para-VII, two para-VIII, one para-IX, three para-XI, and one para-XII in this series. In two, parity was not given.

The discharge for culture was obtained at several prenatal stations and at this time the character of the discharge was noted. Using Doederlein's classification there were 19 profuse discharges, 67 moderate discharges, and in 10 no discharge was noted at all. Thus there were 19 abnormal and 67 discharges. There was characteristic discharge in 8 instances which were as follows:

In Case 88, profuse yellow;
In Case 11, green purulent;
In Case 10, white purulent;
In Case 29, frothy discharge;
In Case 39, profuse yellow;
In Case 55, green purulent;
In Case 60, greenish yellow;
In Case 65, bloody discharge.

The period of pregnancy at which the secretions were obtained varied from the third month to term.

A clinical study of the puerperium was made on 67 of the 97 cases which were studied bacteriologically. Twenty-nine cases were lost sight of, some of which were delivered by private physicians, some went to a hospital, a few left the city, and in a small number a diagnosis of no pregnancy was made at their first visit to the Clinic. With a few exceptions the cases studied clinically were delivered at home and the others sent to the hospital for some pathology. At home they were attended at their labors by senior medical students under the supervision of an interne of the hospital and the obstetrical nurses in charge of the outpatient Department. Except in the few cases where the baby was born before the arrival of the students, the patient had the usual vulvar preparation.

The three cultures were obtained in the following manner: One from the lateral wall of the vagina after separating the labia rather widely; the second from the posterior fornix; and the third from the patulous os of the cervix. The latter two cultures were obtained by means of a sterile speculum. Care was taken not to contaminate the secretion from the cervix with secretion from the posterior fornix.

METHOD

The swabs were inoculated within 1 to 2 hours after collection directly into infusion agar to which defibrinated human blood was added in proportion of one part blood to ten of agar. The blood agar was poured into Petri dishes and readings made at the end of 24 and 48 hours.

The hæmolytic streptococci of the beta type appeared as small granular colonies surrounded by a clear zone of hæmolysis measuring two to four millimeters across. Streptococcus colonies forming grayish green zones were classified as streptococcus viridans; in a few instances the grayish green zones were surrounded by a narrow zone of hæmolysis and these were termed the alpha type of hæmolytic streptococcus.

All hæmolytic colonies were transplanted on blood agar plate for further identification. Colon bacilli and staphylococci occasionally formed hæmolytic colonies but could be readily differentiated from streptococci. The beta hæmolytic streptococci in pure culture on blood agar plates formed small, discrete, biconvex colonies. In sugar broth they formed a

TABLE I.—BACTERIOLOGICAL FINDINGS

	Cervix	Post-fornix	Lateral wall of vagina	Total positive in one or other	Case numbers
Streptococcus Hæmolyticus B Type	1	2	3	3	6, 55, 93
Streptococcus Hæmolyticus alpha. .	5	6	5	6	11, 17, 19 20, 27, 28, 88
Streptococcus viridans.	35	38	35	48	
Gram positive cocci. . .	60	61	60	71	
Gram positive bacilli. .	26	25	28	36	
Gram negative bacilli (colon).	11	11	15	17	
Gram negative cocci. .	3	3	3	3	
Yeast.	9	9	9	9	
Streptothrix.	1	1	1	1	
No growth.	12	11	3	..	

flocculent precipitate on the bottom of the tube with a clear supernatant fluid. Lactose, mannit, salicin; were fermented, but inulin was not. Litmus milk was acidified and coagulated. In accordance with Holman's classification these organisms belong to the group of streptococcus pyogenes. Forty-eight-hour cultures in ascites-dextose broth were injected intravenously into rabbits in doses of 2 to 4 cubic centimeters to test pathogenicity. A moderate arthritis but not death of animals occurred. In this respect these strains appeared less pathogenic than the streptococci observed in the tonsils and nasopharynx (6).

DISCUSSION OF THE BACTERIOLOGICAL FINDINGS

The beta type of streptococcus hæmolyticus was found three times in ninety-six cultures —3 per cent (Table I). Other types of streptococcus were found in 54 instances, or in 56 per cent. These findings conform with the statistics as given. Another feature which this table shows is that the further into the genital tract the culture is obtained the fewer are the positive cultures. For example, no cultures were obtained in twelve attempts from the cervix and posterior fornix, while there were only three failures from the lateral wall. Of the cases with characteristic pathological discharges only two revealed the beta hæmolytic streptococcus.

In Table II, are listed all the patients who had temperature of 99.2 degrees F. and over.

In analyzing Table II, it is seen that 25 cases had a temperature above 99 degrees, or 37.3 per cent; 10 had a temperature above 100.4 degrees, or 14.9 per cent; 11 had vaginal or uterine manipulation, or 44 per cent; 13 had vaginal examination, or 52 per cent, and 12 had fever where no vaginals were made, or 48 per cent. Analyzing the entire series of cases it is seen that 49 out of 67 patients had no vaginal examination; of these 37, or 75 per cent, had no fever. Of the 18 patients who had vaginal examination, 13, or 72 per cent, had fever. Of those cases which had a characteristic pathological discharge 5 out of 8 had a rise in temperature. These were Cases 11, 10, 29, 39, and 65. Four out of the 5 cases had vaginal manipulation.

Now studying Table II in relation to the patients from whom the streptococcus hæmolyticus was isolated, it is seen that, in one case only (26), was there a rise in temperature.

TABLE II.

Case number	Greatest height of temperature	Days following delivery on which temp. occurred	Vaginals made	Type of delivery	Remarks
1	99.2	(9)	None	Spontaneous	
2	99.6	1, (2)	None	Spontaneous	
5	99.8	2, 3, (6)	None	Spontaneous	
9	104.4	(10)	One	Spontaneous	Broncho-pneumonia
10	102.2	1, 3, 6, (10)	One	Spontaneous episiotomy	Repair
11	100.4	(2), 6	Several	Low forceps	Manual removal of placenta
14	101.	2, (3), (6)	None	Spontaneous	Delivered at Presbyterian
23	100.	(1), 2, 6	Several	Spontaneous episiotomy	Pre-eclamptic toxæmia
26	103.2	1, 2, (3), 6, (10), 11	One	Cæsarean	Infected wound
28	100.4	1, 2, 3, (6), 10	One	Cæsarean	Had ablatio placentæ
29	99.2	(3)	None	Spontaneous	
39	100.	(1), 2, 6	Several	Spontaneous episiotomy	
46	100.6	(1), 6	None	Spontaneous	
47	101.4	1, 2, (3), 6	None	Spontaneous	Membranes ruptured 4 days prior
51	99.4	(3)	None	Precipitate	
52	99.8	(1)	One	Low forceps	
63	101.2	1, 3, 6, (10)	None	Spontaneous	Had fissured nipple
64	99.4	3, (6), 9	One	Spontaneous	
65	99.6	2, (3), 6	Several	Midforceps	2nd degree tear—vaginal pack
74	99.6	2, (3), 6	Several	Midforceps	2nd degree tear—vaginal pack
77	102.	1, 3, 6, (10)	Several	Forceps	Postpartum hæmorrhage—uterine pack
89	101.	(4), 10	None	Spontaneous	
91	101.4	1, (3), 6	None	Spontaneous	Membranes ruptured 4 days prior
92	100.	1, (2), 3	None	Spontaneous	
94	102.	1, 3, 6, (10)	Several	Forceps	Postpartum hæmorrhage—uterine pack

NOTES:—
() designates day on which highest temperature occurred.
25 had temperatures above 99 (37.3%).
10 had temperatures above 100.4 (14.9%).
11 had vaginal or uterine manipulation, (44%).
13 had vaginal examinations (52%).
12 had temperatures where no vaginals were made (48%).

This patient was delivered by cæsarean section.

In analyzing possible sources of streptococcus puerperal sepsis one must consider the (1) organisms in the vagina of the patient, (2) organisms introduced by the hands or instrument, (3) organisms from throats of physician and attendants who may be harboring virulent streptococci, (4) streptococci from patient's own throat, sinus, or other infected area.

1. As to organisms in the vagina, it is our experience that the hæmolytic streptococcus is rarely present in the normal vagina, also that the organism found is not very virulent and that most hæmolytic streptococcus infections must be considered exogenous.

2. The introduction of streptococcus from without through droplets from the throat secretion which may be deposited on instruments and hands is very probable, for these droplets often contain hæmolytic streptococci.

3. Direct droplet infection from throat of operator or attendant, by sneezing or coughing, is also possible; such droplets may be considered to harbor hæmolytic streptococci, for it has been shown by Davis (23) that the normal throat harbors hæmolytic streptococci in practically one hundred per cent of individuals. If a sore throat is present the streptococcus has an added virulence and is more dangerous to the pregnant woman.

4. The patient's own throat as a source of organisms in the production of sepsis may lead to hæmatogenous infection of the uterus and adnexa.

The use of a gauze face mask during delivery, the exclusion of attendants having sore throat from the delivery room, and the isolation of patients having streptococcic sore throat will be great factors in reducing the number of cases of streptococcus puerperal infection.

SUMMARY

1. The normal vagina rarely contains virulent hæmolytic streptococci and there is no evidence that the presence of such streptococci plays any part in the production of puerperal sepsis.

2. Any manipulation of vagina, either for examination or operative procedure, increases the possibility of puerperal sepsis.

3. Puerperal hæmolytic streptococcic infection is regarded in most instances as evidence of exogenous infection.

4. Droplet infection from attendants is possible and the use of gauze masks during delivery and the exclusion of those having sore throat from the delivery room and from attendance on puerperal women is clearly indicated.

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PROTEIN SENSITIZATION IN ISOSKINGRAFTING

Is the Latter of Practical Value?

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ISO- or homo-skin grafting is frequently employed by the profession to the wondering delight of a credulous laity, who enjoy contributing small squares of skin as sacrificial offerings on the altar of self-inflicted martyrdom. It is a procedure which has captured the imagination of the public and still holds enthralled a considerable number of the members of our own profession. That such grafting is most often a failure and only in isolated cases a success seems little known, and it is still regarded without hesitation as a procedure giving uniformly good results quite comparable to those obtained with autografts. A study of the literature, however, gives an entirely new conception of the difficulties to be expected, and a pertinent case is here presented as illustrating one of the more unusual complications attending such a procedure.

G. T., age 5, was admitted to the Johns Hopkins Hospital on July 27, 1921, following an extensive laceration of the left thigh and lower leg by that modern Moloch, the motor truck. He was brought to the hospital immediately, and an extensive débridement was performed 24 hours later after recovery from profound shock. There were no fractures, but the entire skin from Poupart's ligament to the ankle had been stripped loose, with considerable trauma to the underlying muscles and with lacerations extending into the knee and ankle joints. Vigorous dakinization followed the débridement, and, on August 18, the first skingrafting was performed. Both mother and son were found to belong to blood group II, and there was no agglutination on matching the two bloods. One hundred fifty-one small deep pinch grafts were removed from the mother's thigh and applied to the inner and anterior granulating surfaces of the denuded leg. All the grafts "took," as indicated by the appearance of dark discolored areas in the center of the small pinch grafts within 48 to 72 hours after their application. These areas look very much like small hæmorrhages into the dermis and it is our belief that these hæmorrhages occur through the wounds in the vessel walls inflicted at operation by transfixing the graft with a sharp needle. The appearance of these small ecchymoses is proof that vascularization of the graft has begun and therefore that the graft has taken.

On August 23 it was noted that the grafts had begun to spread at the periphery. Two days later 168 additional pinch grafts were removed from the mother's thigh and applied to the balance of the denuded surface of the child's leg. Within 3 days all of the grafts showed signs of taking and the entire wound was in excellent condition. By September 17 the leg had become almost completely epithelialized by the spreading of the grafts, and only a few small granulating areas remained uncovered. About 2 weeks following the second skin grafting, it was first noted that a rather widespread exfoliative dermatitis had developed over the entire body, and marked desquamation of the skin was taking place on the scalp, face, arms, trunk, and legs. This desquamation also involved the grafted area and on September 29 small blisters on the grafted surface were noted for the first time, resulting in fresh granulating areas which had previously been well covered with epithelium.

A consultation was held with the clinic on skin diseases, and the general desquamating condition pronounced a "seborrhœic eczema" or possibly "psoriasis." The desquamation proceeded at an astonishing rate, however, and within 2 months after the initial complete epithelization of the leg, all the new epithelium except the original grafts had melted away through a process of repeated desquamation. In the meantime, the skin over the rest of the body was in a deplorable state. Weeping fissures and bleeding cracks had appeared in the skin of the face and arms, causing considerable discomfort and a very unpleasant appearance (Fig. 1).

About this time it occurred to me that the general dermatitis was most probably a phenomenon of anaphylaxis or protein intoxication, and a manifestation of sensitiveness to the foreign protein of the mother. The child continued to have a slight rise of evening temperature, with a high pulse rate, and the appearance of slightly blood-streaked stools indicated a possible extension of the desquamation to the mucous surfaces of the intestine. As the original small pinch grafts obtained from the mother were still present, it was decided that these should be removed as being the cause of the patient's difficulties. On December 23, therefore, 3½ months after the first appearance of the dermatitis, all the original grafts, deeply imbedded in granulation tissue, were curetted away. Within 10 days there was a tremendous improvement in the general condition of the patient and the exfoliative dermatitis rapidly disappeared.

In less than 4 weeks after the removal of the foreign grafts the child's skin had cleared entirely, so that a third skingrafting was undertaken, this time from the patient's own thigh. One hundred twenty-two autografts were applied on this occasion, followed in 3 weeks by an additional 87 grafts. No difficulty was experienced in obtaining a permanent epithelial covering for the entire leg by means of these autografts (Fig. 2).

Isoskingrafting has heretofore received scant attention from the standpoint of the reaction of the recipient to the foreign protein introduced from the donor. A plausible explanation of the unusual difficulties encountered here is that we were dealing with an intoxication, or poisoning, due to a foreign protein. The first application of skingrafts from the mother served to sensitize the patient to this protein. The second group of grafts precipitated the anaphylactic reaction dependent upon this hypersensitiveness to the mother's protein, a reaction which manifested itself mainly by a very stubborn exfoliative dermatitis. This persisted over 3½ months, but disappeared immediately upon removal of the foreign skin grafts. This observation may serve to explain the failure of isografts in those cases in which repeated trials are made, i.e., a protein sensitiveness once established is quite effective in preventing subsequent grafts from taking, or from thriving after they have once taken. A pertinent case has just been reported to me in which four trials at isografting were made with melting away of each set of transplants.

Following our observations on this case, a search through the literature was made and it was found that Underwood,[1] in 1914, had reported the following somewhat similar difficulties in a case of extensive burns:

"Skin grafting was begun as early as the local condition warranted, skin being employed from the patient's brother, and later from friends and neighbors. In all, grafting was done at twenty-two sittings and skin was furnished by seventeen different persons. The dates of the earlier grafts are as follows: November 26, 30, December 5, 9, 10, 11, 12, 13, 14, 15, 17. These earlier grafts took readily and throve, but just about the last date mentioned, trouble began. An area about 6 inches square was grafted and did not take; then some of the old grafts began to 'melt.' Succeeding grafts also failed. Over a large area of the left thigh and back where no grafting had been done but autogenous epithelization had progressed well, the tissues mushed and oozed blood badly. Hæmaturia appeared and lasted 2 days, and the heart impulse became irregular and weak." January 23 I ventured again to use a human graft, this from the patient's sister. A temporary take occurred but did not thrive well enough to offer much encouragement. The only human graft which throve thereafter was a very small one from the patient's mother."

[1] H. L. Underwood. Anaphylaxis following skin grafting for burns. J. Am. M. Ass., 1914, lxiii, 775.

Underwood observes:

"So far as I am aware there has been no effort to identify the reaction accompanying repeated skingrafting over large areas with that of anaphylaxis, yet it seems clear that they are closely related if not identical. In the case here reported it is to be noted that not only did two sets of foreign tissue successively lose their power to be transplanted, but also in each case caused distinct reaction in the patient. Yet at the same time, grafts from the patient's sister took to a degree and one from the mother perfectly. One may infer that consanguinity has a favorable influence."

It is evident that no attention was paid to blood grouping, and in view of the later work by Schoene[2] and Masson[3] on blood grouping in skingrafting his reference to consanguinity as a favorable influence is prophetic.

Gatch,[4] in 1911, reported a case of isoskingrafting on three separate occasions with failure of each graft, but he does not attempt to explain it.

George Perthes[5] reports the following observation in an article entitled: "Is Homoplastic Skingrafting Between Brothers and Sisters Comparable to Autografting?"

"A factory hand, age 19, female, whose hair had been caught in machinery, was brought to the clinic with total avulsion of the scalp. The attempt, made on the day of the accident, to cover the large wound surface with Thiersch grafts from the thigh was successful only over a small area of the crown. Ten weeks after the accident the whole back of the head was covered with bright red, uniformly good granulations. Transplantation according to Reverdin was now carried out as follows: on the left half of the granulating surface nine grafts from the patient herself were applied; on the right, nine skin grafts from her own sister, who was two years older than the patient. Both were applied under exactly the

[2] Schoene, Georg. Austausch normaler Gewebe zwischen blutsverwandten Individuen. Beitr. z. klin. Chir., 1916, xcix, 233.

[3] Masson, J. C. Skin grafting. J. Am. M. Ass., 1918, lxx.

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[5] Perthes. Zentralbl. f. Chir., 1917, xliv, 426.

same conditions. Ten days later all the grafts, without exception, autografts as well as isografts, were firmly healed; that is, they appeared to be all alike, and remained firmly attached to the underlying tissues, after careful attempts had been made to wipe them off. Therefore, eleven more grafts from the sister were applied to the right side of the head. Sixteen days after the first transplantation one could notice an essential difference between the autoplastic and homoplastic grafts. While the former showed a distinct border of newly formed epithelium, the latter, on the contrary, had diminished from the edge outward, evidently nibbled away by the surrounding granulations. This decrease could be plainly recognized in the grafts applied at the last operation. Four weeks after the first Reverdin transplantation the contrast between the grafts of different origin was still more striking. While the grafts taken from the patient herself had enlarged their diameter on an average from 5 to 20 millimeters by the formation of new epithelium, those grafts taken from the sister had entirely disappeared."

"It is obvious," concludes Perthes, "that one cannot expect the same results from homotransplantation—even from brothers and sisters—as from autotransplantation."

Lexer[1] in his exhaustive work on free transplants writes very discouragingly of the value of homoskingrafts, and states very positively that one can expect success only when autografts are employed. He emphasizes his unbelief by citing six cases of auto- and isografts on the same wounds with total failure of each isograft and complete success of each autograft. To quote him exactly we find:

"In view of the frequent assertion that it is possible to get isografts to take, in spite of conclusive clinical experiments and histological findings to the contrary, it seems important to state the source of errors in observation which lead to this belief among doctors, a belief which is like a fable handed down from the olden days. The errors of observation depend mainly upon the fact that in isografts there is a rather firm adherence of the graft until the third week which simulates a 'take.' If the defects are not large, there occurs under the drying desquamating isograft an epithelization of the wound surface from the wound edges. This new epidermis is easily mistaken for the work of the isograft. But even with large defects and particularly in granulating wounds following burns, similar epithelization is possible under the dying isograft through the spreading of small cell rests of epidermis, which have remained intact and unharmed by the initial injury."

This last contingency is frequently, met and undoubtedly is a very important agency in the healing of large granulating areas without grafting. In the case under discussion certainly neither of the factors mentioned by Lexer was concerned. Certainly there occurred complete epithelization of the denuded leg by rapid spread of new tissue from the grafts transplanted from the mother. Microscopic sections of these grafts demonstrate conclusively that they had taken and were living tissue at the time of their removal 4 months after their transference from the mother. That isografts will take is demonstrated without the slightest question, but that they may melt away subsequent to a successful take is also demonstrated. The evident intoxication associated with the melting away process in this case may be accounted for by the application of so large a number of grafts, from which absorption of foreign tissue juices could occur. The number of grafts transferred from mother to son within a period of 10 days totalled 319. This would equal a square of skin approximately 15 centimeters by 15 centimeters. The number of autografts which can be applied within a similar period of time is limitless. In an adult case 850 grafts were applied within a period of 3 weeks with a loss of only 23 grafts, while in another instance 801 grafts were applied with a loss of only 3.

To test further the usefulness of isografts we undertook a series of studies on the following case.

M. C., male, age 28 months, was admitted to the hospital on February 27 suffering with an extensive burn of face and chest wall. By March 21 the wound was well covered with fresh, clean granulations, and accordingly a group of autografts was applied in the left axilla. Each small pinch graft took and spread rapidly. The child was found to belong to blood group IV. On April 3, 9 isografts were removed from J. W., a member of blood group IV, and applied to the chest wall, *a* Figure 3; and twelve large pinch grafts, *b* Figure 3, were transferred from E. H., a member of blood group II. At the same time 12 autografts were applied to the wound, *c* Figure 3. All contributions took and were in excellent condition on April 19 as indicated in Figure 4, taken 16 days after the application of the grafts. On April 25, E. H. for the second time contributed ten small pinch grafts, *e* Figure 5. This photograph was taken on May 2, and shows the rapid spread of the autografts, and the coalescing of the isografts in groups *a* and *b* by the extension of new epithelium from their periphery. On May

[1] Lexer, E. Die Freien Transplantationen (2 vols.). Die Neue Deutsche Chirurgie.

Fig. 1. November 30, 3 months after the isografting, The leg is bare except for original small islands of skin. Dermatitis with bleeding fissures on face and arms.

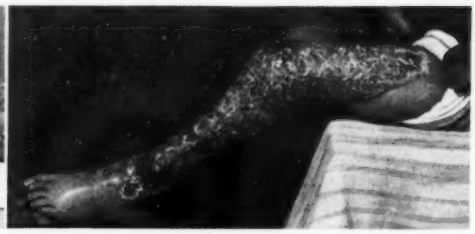

Fig. 2. Appearance of child on May 1, showing the complete epithelization of the leg by autografts.

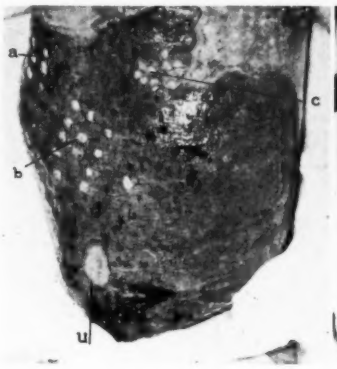

Fig. 3.

Fig. 4.

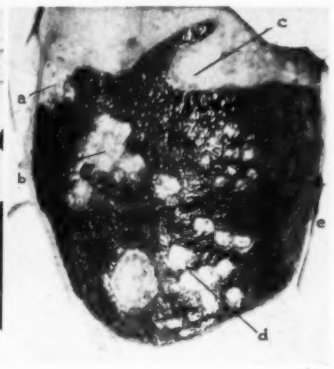

Fig. 5.

Fig. 3. Photograph of M. C. on April 13, showing the epithelization of the axilla by autografts and the application of, *a*, isografts from J. W.; *b*, isografts from E. H.; *c*, autografts from M. C.; *u*, umbilicus.

Fig. 4. M. C., 16 days after grafting showing spread of autografts, *c*, and extension of epithelium from isografts.

Fig. 5. Appearance of grafts on May 2, showing (1) the rapid epithelization by the autografts, *c*; (2) the spread of epithelium from the isografts in groups *a* and *b*; (3) *d*, isografts from M. F. applied on April 19 which have taken and begun to spread; (4) *e*, isografts from E. H. applied April 25.

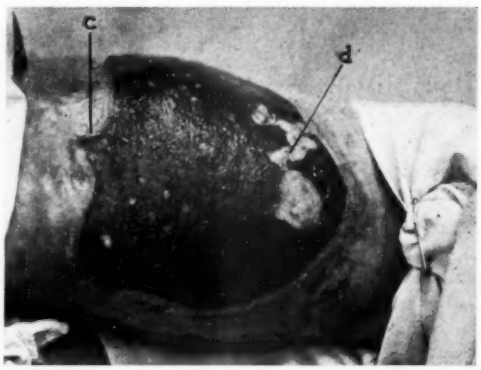

Fig. 6. May 16, we see advancing epithelium from autografts, but complete disappearance of isografts in groups *a*, *b*, and *e*. The isografts in group *d* just begin to show a regressive change not yet demonstrable in photograph. Epithelium advancing rapidly from umbilicus.

Fig. 7. Photograph on June 14, showing the complete disappearance of the isografts in group *d*, and the beginning spread of epithelium from autografts which were applied on June 8.

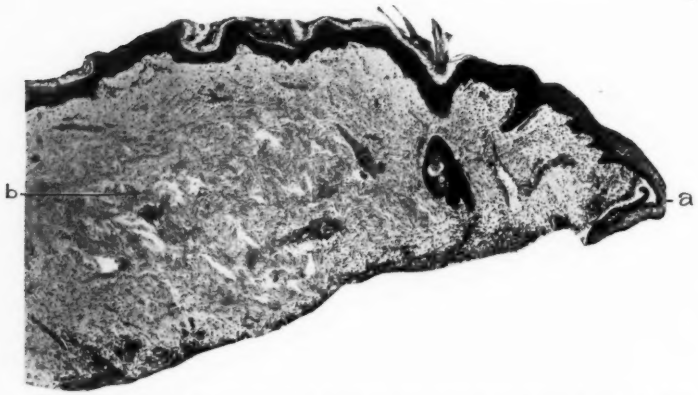

Fig. 8. Microscopic appearance of isograft removed from group *b* on the sixth day after application. The epithelium has spread about 0.8 millimeters beyond *a*, the edge of the original graft.

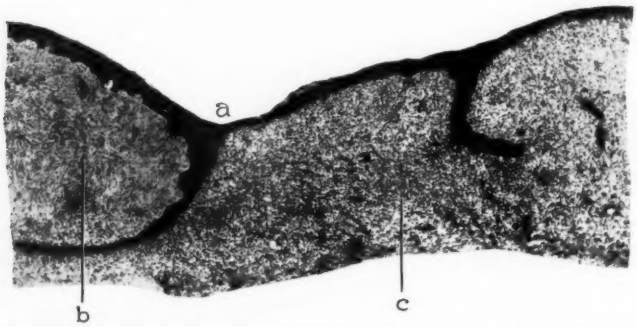

Fig. 9. Appearance of isograft removed on thirteenth day after application, showing the thin layer of epithelium extending from the edge, *a*, of the original graft, *b*, over the granulation tissue, *c*.

3, however, just 30 days after the application of the isografts, there was noted a definite change in the appearance of the new epithelium. The edges seemed to have receded a trifle, they were more clear cut, instead of an indistinct advancing edge, and they seemed thinner. Successive layers of cells seemed to be cast off each day until all the new epithelium which had spread from the original grafts had disappeared, followed in several days more by the disappearance of the epithelium overlying the grafts themselves. By May 11 there remained only a fibrous vestige of each of the original bits of skin (Fig. 6). The second group of ten grafts transferred from E. H. on April 25 did not take but disappeared simultaneously with the first groups of isografts. The disintegrating process involved not only the grafts contributed by a member of a dissimilar blood group, but also those from a member of the same blood group.

In the meantime, on April 19, a number of isografts were contributed by a third donor, M. F., a member of blood group IV, whose blood matched that of the child. Again the grafts took, spread, and remained in excellent and healthy condition (*d*, Figs. 5 and 6) until about May 14, 25 days later, when they, too, began to undergo a change and within 10 days they had melted away entirely (Fig. 7). Meanwhile the autografts were constantly spreading and advancing the epithelization of the denuded area.

The failure of two isografts of the same blood group, and of one isograft from a dissimilar blood group, calls one's attention very forcibly to Lexer's emphatic statement that the success of isografts may be relegated to mythology. Furthermore, it is significant that

Fig. 10. Appearance of an isograft removed on the twenty-second day after application; the epithelium has advanced a considerable distance from *a*, with a remarkable thickening of the epithelium over the granulation tissue, *c*, so as to resemble the normal epidermis overlying the original graft, *b*.

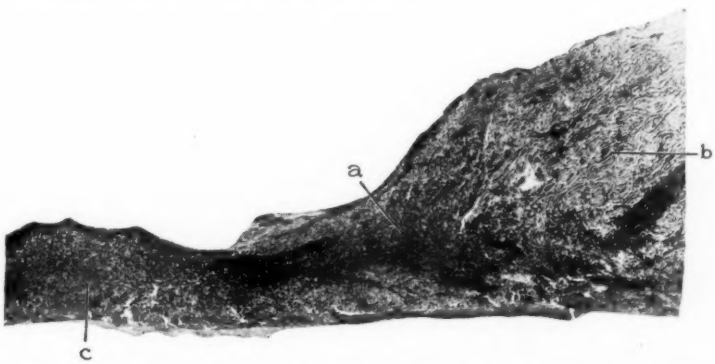

Fig. 11. Isograft removed on the thirty-second day after application, showing almost complete disappearance of epithelium overlying both the original graft, *b*, and the granulation tissue, *c*. One can see just a small area of delicately stained epithelium to left of *a*.

in each case of isografting here attempted there was prompt vascularization with an early outgrowth of epithelium from the graft edges, followed in about 24 to 36 days by complete disappearance of both graft and new epithelium. Moreover, the grafts from an individual of the same blood group acted no differently from those of a dissimilar blood group. It is interesting to note, also, that during the days in which the isografts from the first two donors were rapidly disappearing, the grafts from the third donor were spreading nicely and in excellent condition. It is obvious that the agency which caused the first grafts to disappear had no effect on the viability of the grafts from a third donor. It is highly suggestive that the destroying agency is specific for each set of grafts, and it seems plausible to suppose, therefore, that each group of grafts develops its own antibody which is responsible for the subsequent disappearance of the new epidermis.

Concerning this point, the observations of Schoene in his monograph on "Die Heteroplastische und Homoplastische Transplantation" (1912) are worthy of note:

"The primary toxic effect of tissue juices of the host upon the transplant cannot be denied. We know that the serum of a human under certain circumstances can hæmolyze the red corpuscles of another. One cannot doubt but that through a similar process the success of a transplant can be frustrated. In these toxic injuries surely lysin and agglutinin effects are not alone concerned. Negre calls attention to slight differences in the salt concentration of the blood. Such influences, which may in part depend on osmotic activity, may be of the greatest importance in toxic manifestations.

"In addition to the injury to the transplant by the host, we must recognize also an injury to the host by the transplant. Besides acute poisonous manifestations in the host as one sees not infrequently in blood transfusions, and besides a rapid falling off of a transplanted piece of skin, such as I experienced in mice and Lexer in humans, we recognize also a gradual disintegration of the transplant, as well as a very slow languishing away of the host following the transplant. There can be no doubt that mice frequently succumb following the death of the large foreign skin transplant. That the resorption of other foreign tissues, e.g., blood and liver, can be fatal is well known and I have seen it frequently. Often it is difficult to say, however, in how far the living transplant injures the host, but we must not consider too lightly the possibility of a primary reciprocal toxic injury which may, in many instances, be only very slight.

"A very important question, also, is in how far reactions of immunity and anaphylaxis are responsible for the failure of foreign transplants. That such a reaction occurs cannot be doubted. It is not difficult for me to understand how the washing out and absorption of a transplanted tissue in the first days is quite sufficient to call forth a secondary reaction, which is responsible for the death of the rest of the transplanted tissue. I recall the experiments of Sachs concerning the death of blood corpuscles in a foreign organism accompanied by the simultaneous appearance of specific amboceptors, and the article of Wesslys concerning the appearance of an anaphylactic reaction 10 to 12 days after the single injection of foreign serum into the cornea of a rabbit. We may with certainty assume that analogous occurrences may follow the implantation of similar but foreign tissue or albumin. Therefore, it is scarcely to be doubted that such immunizing reactions are of considerable importance in the question of homoplastic transplantations. The occurrence of death of the transplanted tissue after 10 to 12 days is in agreement with this."

Our observations furnish definite evidence in support of Schoene's views. The progress and decline of each set of isografts is well illustrated by individual grafts removed for microscopic study from group *b*. Grafts were removed on the sixth, thirteenth, twenty-second and thirty-second days after their application (Figs. 8, 9, 10, 11). The first figure shows the graft with evidence of a beginning extension of epithelium from the edge. By the twelfth day the epithelium had advanced over the granulation tissue in a very thin layer (Fig. 9), which gradually thickened until it had assumed the character of normal epithelium (Fig. 10). The specimen removed on the thirty-second day showed only the slightest vestige of very delicately stained epithelium (Fig. 11). An identical picture was obtained in sections of individual grafts removed from groups *a* and *b*.

The full cycle of the isograft ranges from approximately 24 to 36 days. It is easy to understand mistakes of observation on wounds where epithelization from the edges is sufficient to cover the granulating surface in that time, and it is also apparent that observations on isografts must be extended over a considerable length of time to ascertain their exact and ultimate fate. To report a successful isograft on the basis of observations covering 10 to 20 days only is obviously not of the slightest value.

Of particular interest, also, is the evidence presented of a specific process of disintegration involving a specific antibody for each set of grafts. The contributions from the third donor remained in excellent condition during the manifest disintegration of the grafts from the other two donors, and it was not until 4 to 5 days after the total disappearance of the first isografts that the third group showed signs of disintegration.

Our experiences with isografting, therefore, prompt us to recognize and stress a principle in isografting which has heretofore received scant attention and little emphasis, namely, the possibility of sensitizing the patient to the foreign protein of the graft. If a similar protein is again introduced, or if the original graft spreads, one is very likely to encounter the danger of a protein poisoning, a reaction comparable but probably not identical with that of anaphylaxis. This protein sensitization or poisoning may manifest itself by a general reaction, as in our first case, or only by a gradual disintegration of the foreign transplant as in our second case.

Our observations also prompt us to question very strongly the value and wisdom of ever attempting isografts when there is any skin available for autografts. Certainly if one set of grafts melts away, it would be sheer folly to attempt further isografting from that same donor, and probably also from any donor. Our experience also furnishes contributory evidence to the claim that successful isografts exist only in fable and not in fact.

DEPARTMENT OF TECHNIQUE

RESECTION OF THE KIDNEY IN NEPHROLITHIASIS

By HUGH H. YOUNG, M.D., F.A.C.S., Baltimore, Maryland
From the James Buchanan Brady Urological Institute, Johns Hopkins Hospital

IN a previous paper[1] I reported a case of renal calculus in a case of bifid pelvis and double kidney. The ease with which one-half of the kidney was removed from the other and the cut surface closed up by sutures with little loss of blood has lead me to consider the advisability of resection in cases where a stone could not be removed through the pelvis and the renal cortex was so much distended or destroyed that there was little probability of its return to normal after simple nephrotomy for removal of the calculus. For sometime, therefore, I have had it in mind to resect the diseased portion of the kidney along with the stone in such cases, and I wish to report herewith a case in which this procedure has been carried out.

H. L. S., 11504 B.U.I., age 44, was admitted complaining of pus in the urine. About 8 years before the patient had been operated on in New York for floating kidney. No notes of the operation which was carried out have been obtained. At or about the same time the patient underwent appendectomy.

Several months ago he was examined for life insurance and rejected on account of albumin, pus, and blood in the urine. He has had no pain nor discomfort, and urination is normal. An X-ray showed a stone in the right kidney.

Examination. The patient is a well-nourished man and apparently of good strength. Lungs: percussion normal, except for a slight dullness at the left base. At this point there is a scar (operation for suppurative pleurisy 30 years ago). The breath sounds are a little distant and slightly roughened. Lungs otherwise normal. Heart normal. Abdomen: in the right side there is a scar of the operation performed 8 years ago for floating kidney. There is no tenderness and no enlargement to be made out. Left kidney negative. Genitalia: negative except for slight induration of each epididymis. Rectal: prostate and seminal vesicles are negative. Urinalysis: slightly cloudy, specific gravity 1025, acid, no albumin, no sugar, a considerable number of leucocytes, and a moderate number of bacilli. Phthalein test: 300 cubic centimeters of urine secreted in first hour, phthalein 50 per cent.

Cystoscopy. The bladder capacity 250 cubic centimeters, probably no residual urine. The prostatic orifice shows slight enlargement of both lateral and median lobes. There is no hypertrophy of the trigone and the ureteral orifices appear normal. A No. 6 catheter passes easily into each ureter without meeting any obstruction. Comparative urinalysis: right—smoky, cloudy, leucocytes none, red blood cells in moderate amount, no bacteria, urea 13 grams; left—smoky, cloudy, no leucocytes, considerable amount of red blood cells, no bacteria, moderate number of epithelial cells, urea 18 grams. Cultures from both sides sterile.

X-ray shows an oval calculus about 1 centimeter thick and 1.5 centimeters long in the region of the upper portion of the right kidney immediately back of the middle portion of the last rib, as shown in Figure 1. Pyelogram: thorium nitrate injected slowly by gravity (Fig. 2). This shows a fairly normal pelvis, normal calyces in lower and middle portion of the kidney. The upper calyces are connected with the kidney by means of a small opening which appears to be about one-eighth of an inch in diameter and about one-half inch in length. Above this a small amount of thorium has penetrated to the region occupied by the stone, but no marked dilatation is made out, though a somewhat irregular shadow indicates that the thorium has probably mixed with fluid in a sacular portion of the kidney.

Impression. We have here a case of calculus in the upper portion of the right kidney. This calculus is separated from the pelvis by a marked narrowing through which it could not be extracted. It would be necessary to go through the cortex to remove it. The indefinite, irregular shadow indicates pus in the upper portion of the kidney and probably considerable destruction there. The excellent condition of the urine and the large urea (four-fifths that of the left side) shows that the larger part of the kidney is probably sound. Therefore, it seems advisable to carry out the operation which we have had in mind so long; i. e., resection, if at operation considerable destruction of the portion of the kidney occupied by the stone is verified.

Operation, by Dr. Young. Gas, oxygen, and ether. Resection of upper third of right kidney for localized pyonephrosis with calculus. Suture of cut edges with interrupted chromicized catgut sutures, approximating raw surfaces. Gauze pack to the side of suture in front and beneath kidney. Wound closed with continuous chromicized catgut suture in two layers for the muscle, and skin wound closed with clips. Gauze and tube drainage at upper angle. Only slight amount of hæmorrhage. Condition excellent.

The kidney was exposed through an oblique curved incision which extended from above the last rib down and backward above the crest of the ilium. The muscles were divided and excellent exposure of the kidney obtained. As a result of a previous operation, there was a considerable amount of scar tissue and adhesions, but the kidney was finally freed. Examination showed

[1] Young and Davis.

Fig. 1. Roentgenogram showing calculus in region of upper portion of right kidney.

Fig. 2. Pyelogram showing fairly normal pelvis, normal calyces in lower and middle portions of kidney. The upper calyces are connected with kidney of a small opening.

that the ureter and pelvis were normal in appearance and the lower two-thirds of the kidney looked normal. The upper third of the kidney was irregular, cortex thin, and between this and the lower two-thirds of the kidney there was a distinct depression which somewhat suggested the appearance of double kidney. This portion of the kidney seemed to have a separate blood supply, but the pelvis was single.

Fig. 3. Calculus found at operation.

Incision was made through the cortex, where it was very thin, to remove the calculus. A large amount of brownish material escaped, and along with this came the calculus which measured about 1 centimeter in diameter and 1.5 centimeters in length, as shown in photograph (Fig. 3). Investigation then showed that there was an irregular, sacculated condition of the upper third of the kidney with very little normal cortical substance, and that this connected with the major pelvis by a very narrow junction about 5 millimeters in diameter. Through this, instruments were gently inserted and no stone was detected in the pelvis or lower calyces. A flexible probe was also passed without difficulty through the ureter down to the bladder. It was then decided to carry out the operation of resection and this was done as shown in Figure 4. With a scalpel an incision was made through the cortex along the depression which indicated the demarcation between the healthy lower and the diseased upper portion of the kidney. There was moderate hæmorrhage and clamps were immediately placed around the pedicle of the kidney so as not to include the ureter and pelvis. After this the resection was continued without difficulty. All vessels supply-

Fig. 4. Incision being made through cortex of kidney showing method of resection.

ing this upper portion of the kidney were ligated by means of a transfixation suture, and the diseased portion was removed in one piece. This revealed the inferior portions of three calyces, the rest of which had been completely removed. In the center was the opening which connected with the pelvis below. This was about 5 millimeters in diameter and consisted of normal-looking mucosa surrounded by an area of fatty tissue from 3 to 8 millimeters in width. The removal of this involved tissue produced a wedge-shaped depression in the kidney, as shown in Figure 5, *a*. The mucous membrane was curetted thoroughly from the remaining portions of the calyces and the raw surfaces were drawn together by mattress chromicized catgut sutures, which were placed by means of a long, straight needle (Fig. 5, *b*). When these sutures were tied a good approximation of kidney substance was obtained, except along the outer edge. By tying the loose ends to the ligations vertically across the outer edge, complete approximation of the cut surfaces was obtained, as shown in Figure 5, *c*. The rubber-coated pedicle clamps were then removed and blood began to escape from the lower portion of the wound, but was controlled by a single additional stitch through the kidney substance in the depth of the wound. The hæmorrhage was completely arrested, and the kidney was returned to its bed with a strip of gauze at the upper end and also in front and behind (this was probably unnecessary). The wound was then closed as above described, and the patient was returned to the ward in excellent condition. He received an infusion of 1500 cubic centimeters of salt solution. Pulse 90.

Convalescence. June 20: Patient has been doing well, highest temperature 100.5 degrees. Slight drainage of urine through gauze. One pack removed. June 22: Last pack removed. Slight bleeding. Temperature 100°. Continues to drain urine through tube. June 27: Slight drainage of urine. Temperature normal. July 4: Tubes inserted for Dakin's solution in sinus. July 7: Wound sterile. Looks

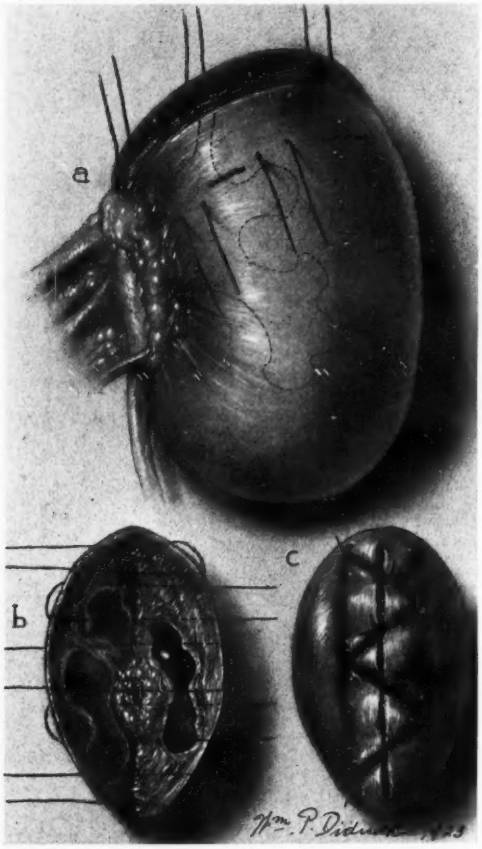

Fig. 5. Method of suturing and controlling hæmorrhage of remaining part of kidney.

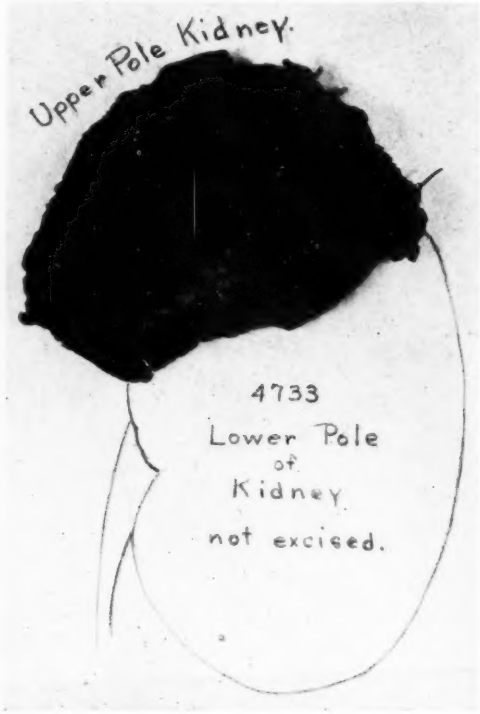

Fig. 6. Photograph of kidney specimen removed at operation.

healthy, no organisms on examination for bacteria. Temperature normal. July 10: Condition improving.

Pathology. The specimen consists of a resected portion of a kidney containing a calculus which measures 1 and 2 centimeters and is irregular in shape and presents a somewhat bifid appearance. The kidney substance removed measures 8 by 5 by 3.5 centimeters in size. The outer surface contains much adherent fat. Along the cut edge where the resection was carried out the kidney varies from 2 to 3 centimeters in thickness and presents an irregular surface with three cavities which are continuous with dilated calyces. The intervening kidney tissue presents an unhealthy, fibrous appearance. Section through the entire mass reveals a series of irregular cavities which communicate with each other and are evidently dilated calyces with very thin cortex surrounding them. Almost no healthy renal tissue is present, except at point of resection. The mucous membrane of dilated calyces is somewhat irregular and in places granular and almost papillary.

Microscopic report. Four sections, all similar. The kidney has everywhere a slight round cell infiltration, with moderate increase of nuclei in the glomeruli. In certain areas, along the vascular columns, the infiltration is much increased. There is some fibrosis, the tubules are compressed or destroyed, and the glomeruli are hyalinized. In a few places are pockets of leucocytes, mostly mononuclear, with some polymorphonuclear, forming small abscesses. No epithelioid cells, zonate arrangements, caseation, giant cells, or anything suggesting tubercles seen. No tumor. In two or three tubules are found granular blue staining deposits, with absence of epithelium, suggesting intratubular calcareous deposits. The infiltration becomes more pronounced and diffuse near the pelvis, and to it is added marked vascular congestion, but it remains predominatingly mononuclear. Diagnosis: chronic pyelonephritis associated with calculus.

Our experience in this case seems to justify in every way the resection of a diseased kidney pole occupied by a calculus. I am confident that had we simply removed the stone and drained the upper portion of the kidney, convalescence would have been more tedious and the ultimate result would have been bad. As it is now, the patient has as much healthy renal tissue on the right side as if a simple nephrotomy had been done and the chance of recurrence of stone has

been eliminated in this region and an opportunity to restore the urinary tract to normal has been furnished.

I believe this case justifies a much more radical method of attack in cases of stone in the kidney in which a part of the kidney is seriously injured and the remaining portion apparently healthy, particularly if the connection between the diseased portion of the kidney and the pelvis is small and the drainage from it therefore incomplete and unsatisfactory.

LITERATURE

Since carrying out this operation a hasty survey of the literature has been made to see whether anyone else has reported this method of attack in stone in the kidney. We have been able to find only one reference which is as follows:

Koenig[1] in 1919 reported the case of a young man of 17, who had symptoms of calculus for one year.

Urine was cloudy. X-ray showed an enlarged left kidney which contained a stone. Ureteral catheterization and X-ray showed a normal right kidney. On June 9, 1919, Koenig carried out an operation which he describes as follows: "With a lumbar incision, exposure of the left kidney was obtained. A stone in the upper portion was removed through the cortex, as was also a stone in the pelvis. Next, the atrophic upper pole was opened without clamping the kidney pedicle. Evacuation, completely, of a large stone from the pelvis, and, lastly, the removal of a date-shaped stone. The pelvis was dilated. The contents were cloudy but not purulent. Below, the ureter was free. Resection and suture of the upper atrophic kidney pole. Dilated pelvis reduced by sutures. Drainage of wound. Good result. September 5, 1919, examination shows a small granulating wound. Urine still cloudy."

Koenig mentions in his brief report a case in which Kuester had carried out "resection of the kidney pole in a case of pelvic stone." Koenig's article is merely a short abstract of his report before the Aerztlicher Bezirksverein Wuerzburg, and careful search of the literature fails to reveal any publication of the complete paper.

CONCLUSIONS

This case of renal calculus, in which the upper pole of the kidney was completely destroyed, and the lower two-thirds of the kidney healthy, shows, by the good results following the resection of the diseased portion surrounding the stone, that such an operation is simple, practical, and radically curative. I believe such cases are not uncommon, and that resection may often be preferable to simple nephrotomy which leaves behind the sacculated, badly diseased portion which surrounded the calculi.[2]

[1] Nephrotomie mit partieller Nierenresektion wegen Nierensteinen. Muenchen. med. Wchnschr., 1919, lxvi, 702.

[2] I have recently seen Dr. W. E. Lower do a very similar operation in a case almost identical with the one I have reported.

INDICATIONS FOR INTERNAL SPLINTING OF THE SPINE

By PAUL B. MAGNUSON, M.D., F.A.C.S., Chicago

SINCE the introduction of internal splinting of spine by bone grafting, one method has been followed almost exclusively by the majority of men who do this type of work. This was described by Albee and is usually referred to as an Albee bone graft. The procedure followed by him consisted in splitting the spinous processes and laying a comparatively small piece of bone between the split halves of the processes and suturing it in place with kangaroo tendon. This, in time, provided the graft took and there was callus thrown out from the spinous processes, welded into a solid mass the spinous processes of the vertebræ covered by the graft. When this method is used, it is necessary, however, to immobilize the patient for 6 months to a year before the graft can be relied upon to furnish any sort of sufficient mechanical support. This was the main objection to the operation. In other words, the patient must wear a plaster cast for many months following the operation, which it would seem should furnish mechanical support immediately, if properly done from a mechanical standpoint. It was to correct this fault that the procedure to be described was designed.

The ideal operation should (1) immobilize the spine immediately; (2) relieve the pain; (3) do away with the necessity of external support at least while the patient is in the recumbent position, and be strong enough to allow the patient to be up and around, in from 3 to 6 weeks, with only a support such as a Taylor spine brace applied. We believe that this has been accomplished in a sufficient number of cases at this time to warrant reporting the results.

Every patient, before any type of bone transplantation or other bone surgery is attempted, should be thoroughly and carefully gone over for any focus of infection which might metastasize to the site of operation.

The indications for this operation seem to be increasing as our knowledge of pathology of spine conditions increases. When it was first suggested it was recommended in the immobilization of high dorsal or cervical tuberculosis where a brace would not suffice to prevent deformity. As the evidence increases, however, it is found that even where braces are worn and the disease is not arrested with a reasonable degree of promptness, deformity gradually increases in spite of external support; and it is our opinion that, where proper technique can be applied and the general condi-

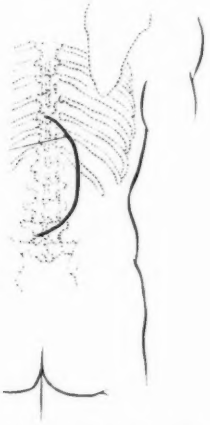

Fig. 1. Skin incision of sufficient length to expose all spinous processes to be included in graft. Skin flap turned back slightly beyond spinous process.

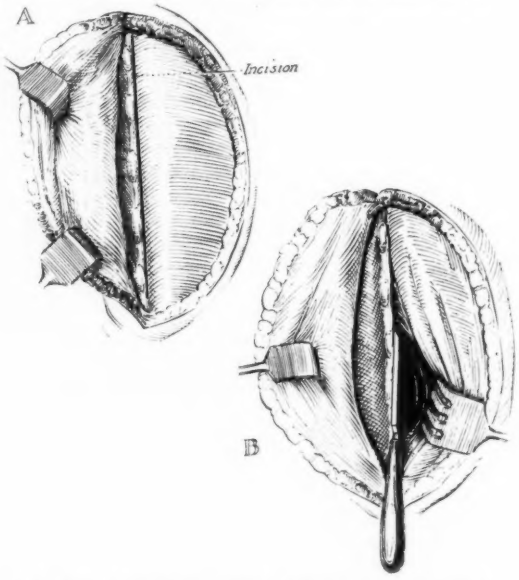

Fig. 2. *A*, Incision through fascia; *B*, removing muscle attachments with shell of bone from sides of spinous processes and laminæ.

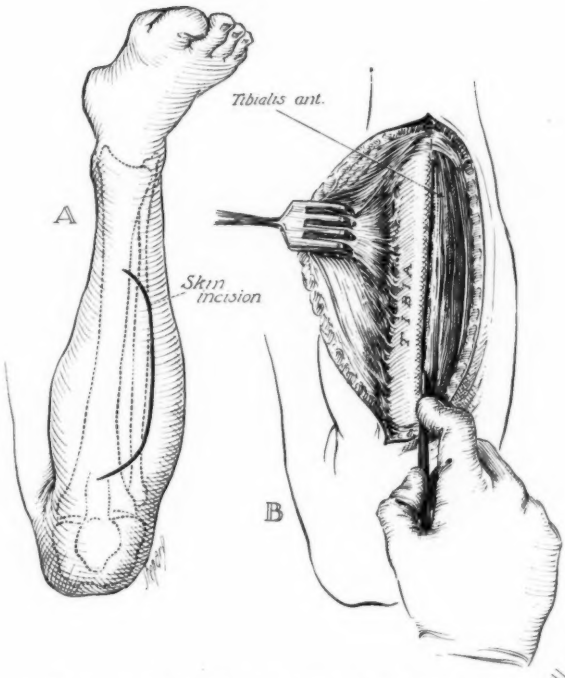

Fig. 3. *A*, Skin incision over anterior part of leg, with knee flexed, for the removal of bone graft. This incision should never be made immediately over the tibia because the skin flap is the only remaining tissue to cover tibia after removal of graft. *B*, Incision between muscles and external surface of tibia preparatory to excision bone.

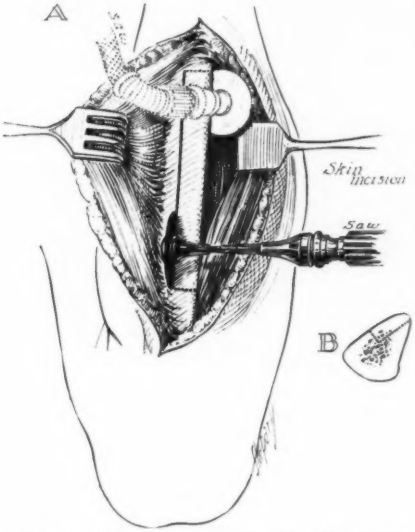

Fig. 4. *A*, Line of graft cut by circular saw. *B*, End view of bone.

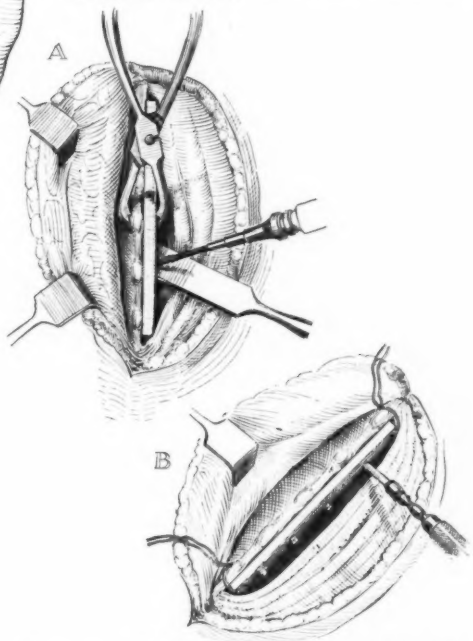

Fig. 5. *A*, Bone graft laid with cut surface of graft against raw sides of spinous process preparatory to cutting thread with tap and inserting ivory screw, as in *B*. *B*, Screws in place reinforced with heavy braided silk sutures through graft and spinous process at each end of graft.

tion of the patient warrants, immobilization of the affected segment of the spine by autogenous bone graft offers a greater possibility of cure than any other method of treatment, as well as the only reasonably sure possibility of preventing deformity regardless of the activity of the infection or the length of time it exists.

In one case in which a bone graft of this type was applied to a tuberculous spine the disease progressed until the bodies of three vertebræ were involved, the original focus having practically destroyed, so far as the X-ray could determine, one entire body; and a cold abscess pointed in the flank which was aspirated many times; yet the individual developed no more deformity than was present at the time of the operation, had no pain, gained weight, and moved around in perfect comfort.

In compression fractures of the bodies of the vertebræ, after having seen a very considerable number of cases treated in all kinds of ways, I

TABLE OF CASES

Case	Diagnosis	Patient	Age	Occupation	Reason for operation	Location of lesion	Length of disability before oper.	Confinement to bed after oper.	Time elapsed for relief of pain	Kind of immobilization after operation	Complications	Final result
1	Slipped, 5th lumbar	J. B.	29	Grocer	Pain over 20 yrs.	5th Lumbar	20 yrs.	3 wks.	Immediate	Taylor-Goldthwait	None	Complete function
2	Fractured spine	L. N.	26	Coal miner	Continuous pain	1st Lumbar	2 yrs.	6 wks.	Immediate	Taylor-Goldthwait	Infection—catgut	Able load 15 tons coal day
3	Fractured spine	T. P.	25	Coal miner	Continuous pain	5th Lumbar	18 mos.	3 wks.	3 mos.	Taylor-Goldthwait	None	Able load 15 tons coal day
4	Overstrain, lumbo-sacral lig.	K.	32	Piano mover	Continuous pain	5th Lumbar	15 mos.	3 wks.	2 mos.	Taylor-Goldthwait	None	Regained strength, changed occupation
5	Fractured spine	M. L.	22	Coal miner	Continuous pain	1st Lumbar	2 yrs.	2 wks.	Immediate	Taylor-Goldthwait	None	Could load 13 tons coal day
6	Slipped, 5th lumbar	P. J.	44	Electrician	Pain in 5th lumbar after frac., 1st dorsal	5th lumbar	4 yrs.	8 wks.	Immediate	Taylor-Goldthwait	Infection	Complete cure
7	Tuberculous spine	J. R.	19	Student	Increasing deformity	1st lum., 12th dorsal	6 mos.	2 wks.	Immediate	Taylor-Goldthwait	None	Complete cure
8	Tuberculous spine	C. W.	19	Printer	Increasing deformity	1st lumbar	3 mos.	2 wks.	Immediate	Taylor-Goldthwait	None	Complete cure
9	Tuberculous spine	M. E. F.	39	Clerk	Pain after 2 yrs. treat.	5th lumbar	2½ yrs.	5 wks.	Immediate	Taylor-Goldthwait	None	Complete cure
10	Tuberculous spine	B. H.	5	Child	Increasing deformity	9-10th dorsal	5 mos.	2½ mos.	No pain after cast removed	Cast	None	Deformity arrested, disease progressive, abscess formation
11	Fractured spine	G. C. L.	32	Coal miner	Continuous pain	1st lumbar	18 mos.	2 wks.	Immediate	Taylor	None	Complete cure
12	Fractured spine	G. L.	19	R.R. messenger	Continuous pain	8th dorsal	2½ yrs.	6 wks.	Immediate	Taylor	None	Relief of pain, 3 mos., final undetermined

have developed the firm conviction that unless there is active callus formation ankylosing the bodies of the vertebræ above and below to the one fractured within 3 months of the time of the injury, and pain has disappeared at the site of the injury, immobilization of this kind is indicated. Compression fractures of the body allows the vertebra above the fracture to change in the angle at which it lays on the fractured body and in its relation to the vertebra below and allows the inferior articular process of the vertebra above the fracture to slip up on the superior articular process of the fractured vertebra reducing the bony contact at the joint surface one-half to two-thirds. This does two things: Allows more weight to fall on the ligaments than if the bony contact were normal at the articular facets and throws the body weight forward. This further increases the strain on the ligaments. It is this overstrain that gives tenderness just below the kyphos, the point of which is formed by the spinous process of the vertebra above the body which has been crushed.

Two of the four cases of immobilization done for relief of fracture of the spine, were coal miners and these two men after disability in one case of 14 months and in the other case, 2 years and 3 months, were able inside of a year to return to work, and their records at the mine show they average, 1, 13 tons per day, and the other 15 tons per day; and both say they have no pain in doing their work.

In cases in which there has been a very marked compression of the body of one vertebra and the gibbus is sharp, throwing the body weight at an acute angle forward above the site of fracture, it frequently happens that pain develops not at the point of fracture, but at the lumbosacral junction at which point there is an acute strain thrown on the muscles and ligaments of the lower lumbar region because the patient cannot stand erect but is forced to carry the body weight, leaning forward. In such cases a bone-graft immobilization including the fourth and fifth lumbar vertebræ and the sacrum is the only method of relieving this pain aside from the constant wearing of a spine brace of the Taylor pattern.

Subacute infections of the spine causing periosteitis or osteo-arthritis, which is local, are also relieved by this internal splinting, when the infection is localized to one segment of the spine. Constant backache and disability as a result of chronic relaxations of the lumbosacral ligaments have been relieved in three cases by this form of immobilization. An article, which is to follow, will deal more fully with the mechanics of this con-

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 6. Graft for tuberculous spine (Case 7 in table). Note lower end of bone graft riding up away from spinous process of third lumbar. The braided silk suture is still holding. A complete cure and immediate relief of pain was established.

Fig. 7. Bone graft between fourth and fifth lumbar vertebræ and sacrum to relieve constant pain at site of fifth lumbar, due to chronically relaxed ligaments, the result of fall. (Case 9 in table.)

Fig. 8. Anteroposterior view of Case 9. Note incomplete union of neural arch, first sacral and distorted neural arch at fifth lumbar. In this case the pain was undoubtedly due to lack of proper bony attachment for the strong ligaments supporting this region.

dition. Suffice here to say that the fifth lumbar vertebra, which sets on the sacrum at an angle of forty-five degrees with the perpendicular and supports the whole body weight at this angle when the patient is in the erect position, is entirely dependent for its bony support on the angle at which its articular processes fit over those of the sacrum. If these processes do not articulate at such an angle as to prevent the forward displacement of the fifth lumbar on the sacrum, as is frequently the case, then all the support must be borne by the lumbosacral ligaments.

In one case which was immobilized by this method, the fifth lumbar vertebra was so movable that the spinous process could be grasped by a lion-jaw forceps and the fifth lumbar could be moved back and forth on the first sacral for an almost unbelievable distance and without impinging on the cauda. This condition was caused by chronic relaxation of the ligaments and the fact that the articular facets impinged upon each other in almost an anteroposterior plane, which took away the support which in the normal individual prevents the fifth lumbar from slipping forward on the sacrum where they are set at an angle of forty-five degrees at least, with the anterosuperior plane.

TECHNIQUE

A curved incision is made of sufficient length thoroughly to expose all the spinous processes to be included in the graft. This flap is laid back to the side of the spinous processes farthest away from its convexity and the incision then protected by towels fastened to the edge of the wound. The heavy fascia covering the erector spinæ muscles is then split, close to the side of the spinous process best exposed. With a very sharp periosteal elevator or the edge of a wide chisel, the erector spinæ muscles and the periosteum with a thin layer of bone attached are separated from the side of the spinous processes and the posterior surface of the laminæ. This leaves, of course, a layer of bone and periosteum with an uninterrupted blood supply, from the muscles, attached to the muscles and laying away to one side. The

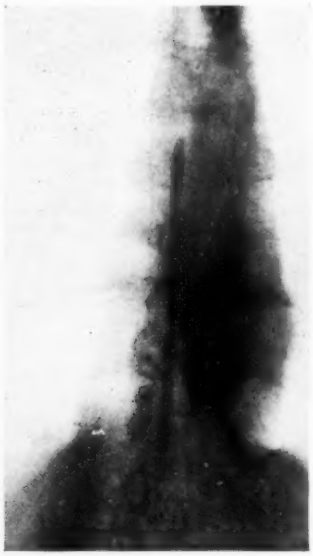

Fig. 9. Lateral view of curved bone graft taken from anterior surface of tibia. Fracture of the spine with subsequent infection (Case 12). Three ivory screws and two heavy braided silk ligatures. The deformity was so great in this case that a straight graft could not be applied. Note shape of graft removed from anterior surface of the tibia.

Fig. 10. Anteroposterior view of Case 12.

muscles then, with the periosteum and shell of bone, are well retracted and the sides of the spinous processes exposed are thoroughly cleaned and left raw, the outer shell, if possible, being removed with the muscle, but if not completely removed with the muscle, removed subsequently. This leaves a raw surface of bone upon which to apply the sawed surface of the graft to be taken from the tibia.

The length of the graft to be used is then measured with calipers; this usually includes two spinous processes above and two below the injured or diseased vertebræ. The leg on the side of the operator is flexed, having been prepared previously, and a curved incision made with the convexity over the anterior tibial muscles. The flap is reflected and the tibia exposed. A line of incision is marked out on the periosteum, the periosteum pushed back, and a piece of bone measuring the necessary length, usually about 5 to 6 inches, in the adult, and one-half inch wide and one-quarter inch thick. Holes are drilled at the corners of this proposed graft and these holes connected by single blade of a small circular saw. The piece of bone removed is transferred to the spine and fitted in place. It may be necessary to curve the graft somewhat to conform with the deformity which exists in the spine, if any. This is possible with a small circular saw and does away with the necessity of cross cutting the graft to bend it, which necessarily weakens it. The widest sawed surface of the graft is laid perpendicular, the rough surface of the scraped spinous processes and the sawed narrow edge of the graft then come in contact with the posterior surface of the scraped laminæ. When the wound is sutured, this leaves two sides covered by periosteum in contact with the muscles on the side and back. The graft is held in position by forceps while holes are drilled through the graft and the middle of each spinous process. Wherever it is possible an ivory screw is put through the graft and into the spinous process. This is sometimes difficult to do in all the processes, but can usually be accomplished in at least two, which gives two very firm points of fixation. The screw does not necessarily have to go in exactly horizontally; it can be put in at the most convenient angle so long as it passes through the process and the graft. The graft is fastened to the other processes by means of heavy, braided silk sutures passed through the hole in the graft and spinous

process and up as close to the opposite side of the spinous process as possible. These sutures are double, one suture being tied around the upper half of the spinous process and the other one around the lower half of the spinous process which gives very strong bridgework support, the graft being fastened through five holes tightly to the spinous processes allowing no motion between any of them and immediately fixing the spine in this position. Braided silk is used instead of Kangaroo tendon because of its lasting support and non-irritating quality. No trouble has been experienced with it in any clean bone case. The muscles are replaced and the fascia very carefully sutured to the interspinous ligament; this also adds strength by covering the graft with a very firm and supporting structure. The skin is closed and the ordinary surgical dressing applied. The patient is returned to bed without other fixation; and is kept in bed until all soreness as a result of the operation has disappeared. He is then fitted with a Taylor spine brace with wide supports on each side of the spine which do not impinge on the graft, and allowed to be about. The brace is worn from 6 months to a year, as may be found necessary.

CONCLUSIONS

1. A heavy bone graft is much preferable to a light one because it may be fastened to the spinous processes in such a way that it will give immediate immobilization, immediate relief from pain, and do away with the necessity of uncomfortable body casts, and allow the patient to move freely in bed and to assume the upright position within 3 weeks of the time of the operation.

2. The ivory screws inserted through a heavy bone graft into the spinous processes make a firmer and stronger fixation immediately than any other device. Heavy, braided silk, where it is not possible to use ivory screws makes a firmer and more constant fixation than does kangaroo tendon or catgut, and does not cause any more irritation of the tissues than do these other materials.

3. This type of fixation of the spine should be done wherever chronic disabling pain and increasing deformity exists as a result of the following conditions:

a. Tuberculosis of the spine;

b. Tuberculous caries of the bodies of the vertebræ;

c. Fracture of the spine—(1) compression of the bodies, (2) fracture of the articular processes;

d. Forward slipping or relaxation of the fifth lumbar vertebra;

e. Chronic strain with relaxation of the ligaments where there is malformation at the lumbosacral articulation with disabling backache.

A NEW TYPE OF MATTRESS PARTICULARLY ADAPTED FOR USE IN CASES OF RECTAL INCONTINENCE

By JOSEPH FRANKLIN MONTAGUE, M.D., New York
Rectal Clinic, University and Bellevue Hospital Medical College

DURING the recent war I had occasion to treat many cases which presented an urgent problem in nursing. These were cases in which the patient was either bed-ridden or was incontinent of fæces or urine or both. The inadequacy of the ordinary hospital mattress in this type of case is familiar to anyone who has been burdened with the care of patients of this type. Even with the most conscientious nursing care it is almost impossible to keep these patients clean and comfortable. Painful bed sores or torturing eczema of the perineal or gluteal regions is prone to occur and add much to the misery of the sufferer.

All in all the nursing care of such conditions has always been a most disagreeable assignment and the fact that such may, with the use of the type of mattress I suggest, be handled with comparative ease and infinitely more comfort to the patient I am sure will prove pleasant news. Besides a genuine pity for the poor unfortunates so afflicted, I have always had much sympathy for the nurses who must attend such troublesome and, needless to say, messy cases.

Working in conjunction with Miss Anna Scanlan, R.N., of the Bellevue Training School, I finally decided upon a design of mattress which has been used with much satisfaction in several large hospitals in New York City and not a few private homes. It may be described briefly as follows:

In size and general appearance the mattress devised resembles an ordinary single bed mattress. This fact increases the range of utility, for it may

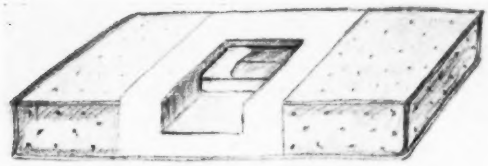

Fig. 1. Shows the recess in the mattress with the receptacle in place.

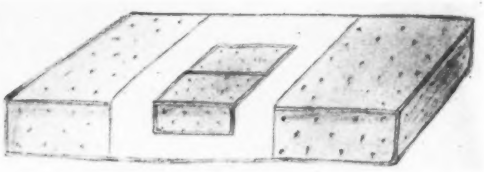

Fig. 2. Shows the mattress complete after removing receptacle and replacing the sections.

be used on any bed or any spring. It differs, however, from the ordinary mattress in possessing a recess built into the center of the mattress to accommodate an excretory receptacle (Fig. 1). This recess is filled by such receptacle and a mattress section or by two mattress sections depending on whether the use of one or the other is required. With the two sections in place the mattress may be used as an ordinary one (Fig. 2). When the receptacle is in use the recess and the mattress for about one foot around is covered with rubber cloth. This is done to protect the mattress in case of accidental spilling of excreta though this, with ordinary care, seldom occurs. The patient is made absolutely comfortable by lying on a rubber ring, cushion or pneumatic horseshoe which is placed on the bed pan or douche pan. The latter has appeared preferable in many instances.

When one wishes to change the pan and replace it with a clean one the patient merely half turns and the outer section is withdrawn. The soiled pan is then replaced by a clean one which is held ready. When the outer section is replaced, the patient is allowed to roll back. In a few seconds, therefore, without the slightest exertion on the part of the nurse, the bed pan may be changed under the heaviest of patients.

In cases not incontinent this type of mattress, because of the depressed position of the pan, allows natural excretionary function without disturbance to the patient. This for instance, in case of pneumonia is a matter of prime importance because the strain attendant upon the use of a bed pan on the level type of mattress throws a decided and undesired strain upon the heart, with danger of producing dilatation. Likewise, in a case of apoplexy where any exertion causes an increase in blood pressure with a consequent risk to the patient, the great comfort and ease of evacuation which attends to the use of the mattress I have described, insures safety. To mention one more instance, there are cases on record—in a postoperative case with a laparotomy wound—in which the strain put upon the sutures of a fresh laparotomy wound by attempts to use a bed pan on the level type of mattress has resulted in an opening of the wound and an extrusion of the intestines. Why such a catastrophe does not occur more often is a wonder to me when I observe the great strain put upon the wounds by the extreme extension required in the use of bed pans on ordinary mattresses. Needless to say all such strain is avoided by the use of a mattress such as I suggest. Besides the uses mentioned, it can be well utilized in procuring specimens in difficult cases, for giving enemas, for catheterizations, for giving high colonic irrigations, in obstetrical cases and in those psychopathic cases that need continual restraint. It is also of great value in cases where plaster casts are worn over a period of time.

The use of the mattress devised has proven most efficient in every respect. It is infinitely more comfortable and cleanly for the patient, and evacuations are a matter of comfort and ease. From the standpoint of the nurse, the ease with which cleanliness is maintained and the patient's excretionary wants attended to, the device is particularly attractive. Linen is not soiled as quickly nor are the frequent changes of linen required as with the ordinary type. This economy of time and effort of the nurse leaves her free for the performance of other duties.

In conclusion, I believe it may be modestly said that the mattress herein suggested has passed the experimental stage. It has been used with much satisfaction in several large hospitals in this city. In private homes it has also met with flattering commendation. I sincerely believe the management of bed patients is decidedly aided by this device.

THE TREATMENT OF GONORRHŒAL ENDOCERVICITIS, BY HEAT[1]

By BUDD C. CORBUS, M.D., F.A.C.S., and VINCENT J. O'CONOR, M.D., Chicago

EVER since Moses (1) lead his children out of the wilderness, the human race has been afflicted with gonorrhœa and during all this time, the female genital organs have suffered not only from the effects of the gonococcus but almost as much from the many methods that have been suggested for their relief. In a large measure, this has been due to the anatomical structures affected and to the lack of a definite knowledge of the pathology of the female urogenital tract following the acute stages of gonococcal infection. It is unnecessary to review the many methods which have been tried for the relief and cure of this stubborn infection. It is well known that a large percentage has failed to effect a cure because of the obstinacy of the endocervicitis and the inaccessibility of the maculæ gonorrhœicæ to topical applications. Therefore, it is not surprising that surgery, as a final resort, has been so often employed in an attempt to clear up this chronic infection.

RECENT WORK EMPHASIZING THE MINOR RÔLE PLAYED BY THE TUBES AND ENDOMETRIUM IN KEEPING UP ENDOCERVICAL INFECTION

Curtis (2) and others, in investigating the bacteriology and pathology of the fallopian tubes removed at operation, have shown that chronic endometritis, as a clinical entity, is very uncommon, and that persistent infection of the endometrium seldom exists unless maintained by other lesions, such as cervicitis or cellulitis.

The corporeal endometrium tends to remain free from chronic infection. Histological examinations and cultures from cervices obtained at operation have revealed that bacteria frequently lodge in these tissues; especially in the vicinity of the actively secreting glands of the mucosa. It has been found, also, that granulations and strictures are often present in the canal of the cervix. It has rarely been possible to obtain gonococci in cultures from thoroughly ground fallopian tubes removed from patients who have been free from fever and leucocytosis for a period of 10 days or 2 weeks. The fallopian tube, therefore, can hardly be considered as a focus for perpetuating a chronic gonorrhœal infection of the cervix. Persistently active gonorrhœa of the tubes is evidently ascribable either to recurrence of infection from without or repeated invasion of bacteria from the chronically infected lower genital tract.

If the patient can be early isolated from the source of the infection, a single attack of gonorrhœal salpingitis is usually borne without protracted clinical symptoms or severe pathological results. In a series of three hundred patients with evidence obtained by the histories, examination of the external genitalia, and operative findings combined with laboratory studies, it was ascertained that the gonococcus was responsible for 70 per cent of the cases.

Further investigation (3 and 4), comprising a combined bacteriological and histological study of the endometrium in health and disease, has shown that chronic endometritis, *per se*, with bacteria present in smears or cultures, is practically to be ruled out as a clinical entity.

The gonococcus is most frequently found, because it is the infectious organism most often brought in contact with the cervix. Since chronic infections of the corpus uteri are as a rule secondary to infections in other pelvic organs, intrauterine treatment has little value, because the focus of infection is not within reach. The discharge that is the most infectious and persistent comes from the endocervical glands. It is here, that treatment must be directed as the gonococcus localizes in the glands of the cervix and endocervix and is the predisposing cause of a chronic purulent discharge in a large percentage of women who have not borne children and the predisposing cause many times of leucorrhœa in women who have borne children. Any method of endocervical treatment which will destroy the gonococcus and at the same time cause only a minimum impairment of tissue, should be an ideal way of curing this troublesome and chronic infection.

THE USE OF HEAT TO DESTROY THE GONOCOCCUS

The application of heat as a therapeutic measure in the treatment of neisserian infections in the male is not new. Heat applied to an arthritis of gonorrhœal origin has long been an accepted and valuable therapeutic agent.

The different forms of psychrophores designed both for urethral and rectal application of heat and cold are familiar instruments in the armamentarium of many surgeons.

[1] Read before the Chicago Medical Society, December, 19, 1923.

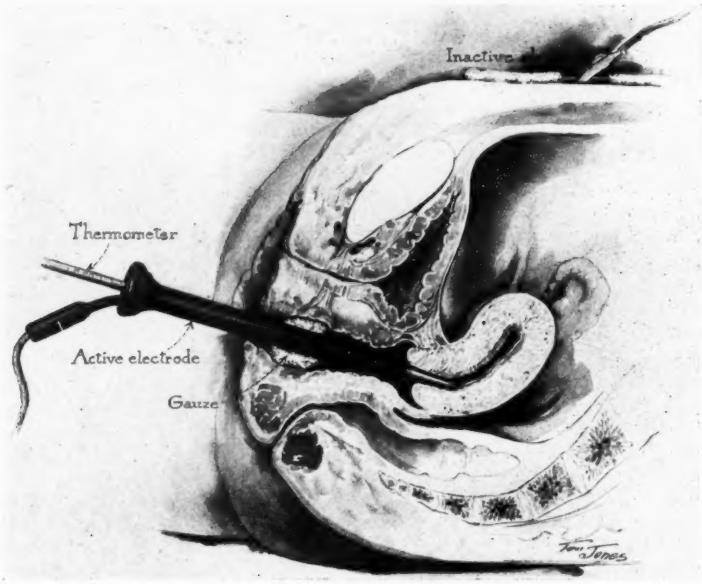

Fig. 1. The inactive electrode is seen just back of the symphysis pubis, separated from the skin by a gauze pad. The cervical thermophore comprises the active electrode. By means of the diathermy current the heat is passed between the two electrodes, the active electrode being the smaller becomes the hottest. The thermometer that passes into the core of the instrument registers the temperature of the electrode.

In 1913, Fulton (5) called attention to the use of heat applied to the urethra by running hot water through a modified psychrophore. This instrument had thermometers attached so that a definite temperature could be maintained within the urethra. The results in a small number of cases were excellent, but his instrument was too cumbersome. Vorner (6) tried curing the gonorrhœa in a similar way, but heated his "double sound" by a mignon lamp. In order to solve the problem in another way, Weiss (7) keeps the patient in a hot bath until the entire body is raised to the required fever temperature. In this way he artificially induced fever. In eleven cases of recent gonorrhœa, he had the patient take hot baths for periods of 40 to 45 minutes during which time the temperature of the water was gradually increased from 104 degrees F. (40 C.) to 110 degrees F. (43.5 C.). In one case, the body temperature was raised to 108 degrees F. (42.6 C.) in a 40 minute bath, and at once the gonococci entirely disappeared from the urethral discharge.

Many workers have tried to elaborate on the psychrophore. Others, including one of us (Corbus, B. C.), have tried to construct a heated sound. Its use has been quite popular among the German urologists. The reports published by Frank (8), Rost (9), Kyaw (10) and Scharff (11) are quite interesting. Previous to this time, these different methods of applying heat have been confined to infections of the male urethra, but for the most part have failed because of the difficulty in maintaining a fixed temperature in a structure so vascular.

The resistance of tissue to different degrees of temperature.—In order to determine the effect of different degrees of heat on the mucous membrane, Santos(15) inserted the positive electrode into the urethra of dogs and heated the instrument to 113 degrees F. (45 C.) for one hour. No distress was apparent during the entire treatment. The dogs were sacrificed after 8 days, and grossly, the urethra showed no abnormality. In comparing the heated and unheated segments microscopically there was merely an epithelial desquamation in the heated portion.

Santos further experimented on himself and others. He states that up to 109 degrees F. (43 C.) nothing abnormal is felt within the urethra, but starting at 109.4 degrees F. (43 C.) there is a gradual

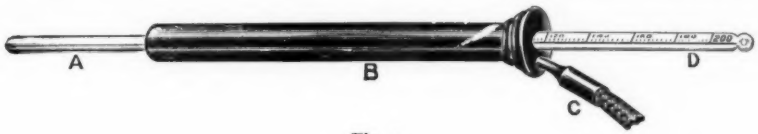

Fig. 2.

Fig. 3.

Fig. 2. The Corbus cervical thermophore. The instrument consists of a very thin nickel silver shell, *A*, closed at one end and measuring 5 millimeters in diameter. A hard rubber sheath, or covering, *B*, measuring 15 centimeters in length and 1 centimeter in diameter is attached, thus allowing an extension of 4 centimeters for insertion in the uterus. An insulated terminal, *C*, is provided for attachment of the cable, supplying current. A thermometer, *D*, is inserted to the full depth of the shell and reading taken from the exposed portion. It has been found that the greatest accuracy is necessary in constructing the instrument to insure its proper performance. Any small diathermy machine capable of supplying 800 to 1000 milliamperes will produce heat enough to apply the thermophore.

Fig. 3. The wire bath speculum. *1*, The instrument as it should be when inserted. Under no consideration is the patient allowed to insert the speculum unless lying flat in the bath-tub. *2*, The instrument with plunger pushed forward thereby giving the maximum effect of the Hot Sitz Bath.

sensation of warmth and this is increased to a point of intolerance at 114.8 degrees F. (46 C.). He has kept the urethra heated to 113 degrees F. (45 C.) for one hour without the slightest tissue destruction.

Therapeutic possibilities.—We must accept the fact that gonorrhœa persists in women largely because of the continued presence of the gonococcus in the para-urethral, the cervical, and the endocervical glands. Frequently the continued application of locally effective germicidal agents will bring about a complete disappearance of the gonococci in these structures. But in a great many women treated by douches and local applications, the gonococci remain securely in the depth of the endocervical glandular tissue. A germicidal agent is therefore needed, which will penetrate the active foci. From the foregoing, it must be clear that heat constitutes the most ideal gonococcicide, provided it can be induced into the depths of the tissue and so controlled that it will destroy the infection and leave the normal tissue unharmed.

In an effort to accomplish a cure in these cases we have utilized the well-established fact that the gonococcus is instantly destroyed at a temperature of 113 degrees F. (45 C.) and also that prolonged exposures of somewhat lesser degree gradually bring about its disintegration. We further have found that it is possible to maintain a temperature of 116 to 117 degrees F. (46.5 to 47.5 C.) within the cervix for 40 minutes without causing pain, discomfort, or tissue destruction.

With the advent of the more powerful high frequency machines it has become possible to get heat into "the depth of the tissue" by diathermy. Geyser (12) and Santos (16) have reported unusually favorable results from the application of induced heat to the male urethra, but it seemed to us that they were unable to measure accurately the degree of thermopenetration.

It occurred to us that an instrument could be devised so that the active electrode would fit the cervical canal and at the same time enable us to control the temperature by a most simple and easily applicable method.

DESCRIPTION OF THE CERVICAL THERMOPHORE

The thermophore, as devised by one of us (Corbus, B. C.), consists of a very thin nickel-silver shell, *A*, closed at one end and measuring 5 millimeters in diameter. A hard rubber sheath, or covering, *B*, measuring 15 centimeters in length and 1 centimeter in diameter is attached, thus allowing an extension of 4 centimeters for insertion into the cervical or urethral canal.

An insulated terminal, *C*, is provided for attachment of the cable, supplying current. A thermometer, *D*, is inserted to the full depth of the shell and reading taken from the exposed portion.

It has been found that the greatest accuracy is necessary in constructing the instrument in order to insure the proper temperature regulation.

Any diathermy machine which is capable of supplying 800 to 1000 milliamperes will produce heat enough to supply the thermophore.

TECHNIQUE

The patient is placed in the lithotomy position. It is well, but not entirely necessary, to have the table covered by a rubber pad. The indifferent electrode, 4 by 6 inches in size, is made of block tin. This is placed over the suprapubic region with a gauze pad saturated with hypertonic salt solution imposed between the electrode and the skin. The gauze must be kept moist during the entire treatment. A vaginal speculum having been inserted, all mucus, pus, and débris is removed from the cervical canal and vagina by alkaline swabs. The active electrode (cervical thermophore) is then placed in the cervical canal and anchored to the speculum to insure its being held in place. The contacts are made and the current gradually turned on. Care should be used in watching the rise of temperature as indicated by the thermometer. The thermophore should be kept under constant attention during the entire treatment.

When the thermometer registers 116 to 117 degrees F. (46.5 to 47 C.), the current is stabilized and this degree of heat is continued for 30 to 40 minutes. The treatments are repeated every week or ten days. The treatment is absolutely painless as evidenced by the fact that many fall asleep during the seance.

Following this treatment, the cervical discharge changes very rapidly from a thick purulent to a thin watery character and cervical erosions rapidly heal. In the interim between treatments, a wire vaginal bath speculum is inserted by the patient herself two or three times a week. She then remains in the hot bath for one-half hour. The heat of the water should be gradually increased from 100 to 110 degrees F. (37.78 to 40 C.).

Infection of Skene's or other urethral glands call for separate consideration. It must be distinctly understood that this form of treatment in no manner replaces surgery, where surgery is indicated. Bartholin gland abscess, fistulæ, salpingitis or pelvic abscess call for the usual surgical consideration.

CLINICAL RESULTS

Realizing that any claims for a permanent cure of gonorrhœa in women must be based upon a long continued observation, we have withheld this report for a period of 4 years. During this time we have had the opportunity of repeatedly examining many of these patients and have thus been able to satisfy ourselves that this method brings about a complete and permanent elimination of the gonococcus.

Thirty-five women have been treated by this method. Of this number eighteen have been observed repeatedly during the past 3 years. Twenty-two had been checked for 2 years. The remainder disappeared after the cessation of active treatment and were not available for observation after the 3 month period following the application of their discharge technique.

Our routine has been to study microscopically the cervical discharge coincident with each heat application. The treatments are continued until the gonococcus has been absent from five successive smears. The patient is then instructed to return twice monthly for examination of the cervix and urethra. One of these examinations is made 48 hours after the cessation of the menses. If no gonococci are found during the first 2 months an endocervical application of 5 per cent silver nitrate solution is made and smears obtained twice during the week that follows. If these are negative, the patient is declared well.

It should be emphasized that three negative cervical smears taken in quick succession after cessation of a given method of treatment do not justify the assumption of a permanent cure.

In twenty-two carefully studied cases, the gonococcus disappeared permanently from the cervical discharge as follows: after one treatment, five cases; after two treatments, seven cases; after three treatments, four cases; after four treatments, two cases; after seven treatments, four cases. The fewest treatments given in any individual case were four, and the most fourteen.

Four of these twenty-two women have married, borne children and yet showed no sign of recurrence.

CLINICAL APPLICATION

This method is contra-indicated during pregnancy, in the early acute stages of the infection or when evident active pelvic inflammatory changes such as salpingitis or pelvic cellulitis are present.

The most pertinent point about this method of treatment lies in the fact that its application entails painstaking co-operation between patient and physician, slightly more prolonged office treatment than is usual, and sufficient intelligence on the part of the patient to realize the importance of getting completely well.

For these reasons we have been able to apply this method only to private patients of the more

intelligent class. Under proper supervision it might be applied to institutional or dispensary practice.

SUMMARY

A method for curing gonorrhœa, when the latter is localized in the cervical canal, in women by heated electrodes has been far more successful than any previously tried technique.

It is necessary accurately to control the temperature within the cervix if we expect to get an exact distribution of heat.

The method is painless and devoid of medication. Strictures and cicatrices are avoided.

This report is based upon clinical evidence of complete cure covering a period of from 2 to 4 years observation.

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EDITORIALS

SURGERY, GYNECOLOGY AND OBSTETRICS

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JANUARY, 1924

THE NATURE OF CANCER

IT has always been the case that in the search for theological or philosophical truth, the more difficult the solution the more fascinating the problem; and since there is a little of the philosopher, and perhaps of the theologian, in every properly equipped medical man, it is small wonder that regardless of rebuffs, the hitherto impenetrable secret of *the nature of cancer* should absorb so much of our attention.

Ever since theological theories of disease have been abandoned in favor of purely physical ones, there is no single question to which more thought has been devoted, or on which greater effort has been expended, and certainly none in which thought and effort have met with less real success. It was once said by a great preacher that "the path of science is strewn with the bleached bones of dead theories"; and we may well accept the figure as applicable to our tussles with the nature of malignant disease.

But if the past has been barren of success, there is no reason for assuming sterility in the womb of the future; and it may confidently be stated that our efforts will not cease until the problem is solved, even if the inducement were to be only knowledge for knowledge's sake. But with such a glorious reward for success as the relief of human suffering by ridding humanity of a scourge and old age of a terror, the duty of perseverance is paramount.

It would be folly to surmise the when and the how. It may be that a new method may first have to be discovered or invented that will bear a similar kind of relationship to the elucidation of the problem, that, let us say, the method of staining bore to the study of tissue structure, or the method of culture to the study of bacteria. In the meantime we must possess our souls in patience, in sure and certain hope that the mystery will not forever lie hidden, but will yield its secret, as other mysteries have done. Malaria and yellow fever once looked equally baffling, but their riddles have been read by the genius of inspired investigators.

But though the key to the nature of carcinoma is still hidden, we know something of its ways, and the conditions which favor it; a thing of no small value from a practical standpoint, for though such knowledge cannot be said to command its prevention, it certainly shows how to lessen its incidence, a very real if not a very dramatic gain.

The known conditions favoring the appearance of cancer may be summarized under two heads: first, lowering to tissue vitality; and next, local irritation. Old age is certainly a predisposing factor. It is assumed that this predisposition is due to a process of devitalization of the tissues, which after middle age goes on *pari passu* with the ticking of the

clock. At first blush it would seem that here we have nothing to discuss; old age, however deplorable, being inevitable. This is of course true, and yet time affects different people so differently that it amounts to a blunder to estimate a man's age merely by counting his years. Some men are older at forty than others at seventy, and even octogenarians have been known to keep pace in all essential matters with men who might be their grandchildren. That indefinite combination of qualities known as a man's constitution, and the care he takes of it, are the real factors which determine the rate at which his tissues become devitalized.

Among the more avoidable causes of lowered vitality affecting the body generally, and no doubt each cell particularly, syphilis and the abuse of alcohol are usually conceded first place. But potent as these factors are, even when combined, they do not appear to be sufficient to cause malignancy without the aid of some local influence. Of these local influences the only ones at present recognized fall under the head of irritation. The variety seems of lesser importance. It may be mechanical, chemical, bacterial, or thermal. Smoker's lip is an example of the mechanical form; one fast disappearing with the clay pipe. We are familiar with chemical examples in tar and phenol workers. Bacterial has its best example in the mouth, where a filthy state of the teeth due to prolonged neglect of the toothbrush is so commonly found in association. Thermal irritation has not yet received as much attention as it appears to deserve. The most usual seat is the mouth and throat, owing to the vicious and unnatural practice, especially among women, of ingesting superheated food, and particularly tea. There is a strong suspicion that the greater frequency of post cricoid carcinoma in women may be due to this cause.

But every one of the concomitants, which from their association with malignant disease we have come to regard as factors, either in predisposition or determination may be conspicuous by their absence; and yet the disease mocks our explanations by its appearance. We must then confess to being once more in front of the "big black wall" that turns us back to the precise point whence we started.

"Myself when young did eagerly frequent
Doctor and Saint, and heard great argument
About it and about; but evermore
Came out by the same door where in I went."

ROBERT WOODS

CHOLECYSTOSTOMY VERSUS CHOLECYSTECTOMY

CHOLECYSTOSTOMY versus cholecystectomy, although a trite subject, is not a stale one. If the gall bladder alone is affected, the patient is better off without it. Patients on whom cholecystostomy was performed for gall stones many years ago, some of them 25 years ago, appear with a new formation of gall stones. Cholecystostomy has been performed more than twice on several such patients with return of stones. Gall bladders containing two entirely different kinds of stones, so different that is is apparent they formed at two distinct periods, are occasionally encountered.

The function of the normal gall bladder probably is not very important, but certainly those who have had the experience of examining the gall bladder following cholecystostomy, and finding it bound to the abdominal wall and adjacent viscera with a mat of firm adhesions, can hardly conceive of such a gall bladder functioning. Cholecystostomy, therefore, is not conservative, because conservation means maintaining function. After cholecystostomy, the patient is expected to be symptomatically relieved for a time at least,

possibly for all time. Although cholecystostomy is not truly a conservative operation, the condition of the occasional patient is such as to make it safer from an operative standpoint than cholecystectomy, as in very obese patients or patients with serious constitutional maladies. It is better, in the occasional case, to perform cholecystostomy with the possibility of having to reoperate, than to risk losing the patient with a more radical, primary operation.

If the infectious process is no longer confined to the gall bladder, but has extended down into the common duct, and from there to the hepatic or pancreatic ducts, the whole aspect of the case is changed for the worse, and cholecystostomy rather than cholecystectomy is now the logical procedure. Once the deeper ducts are involved in an infectious process, who can foretell the ultimate result? If cholecystectomy has not been performed, secondary operation on the common duct is comparatively easy; in the absence of the gall bladder it is difficult and dangerous. In cases of obstruction beyond the cystic duct causing biliary obstruction, as in chronic pancreatitis which sometimes occurs subsequent to operations on the common duct, cholecystogastrostomy or cholecystoduodenostomy affords excellent results. Why burn our bridges by an ill-advised cholecystectomy?

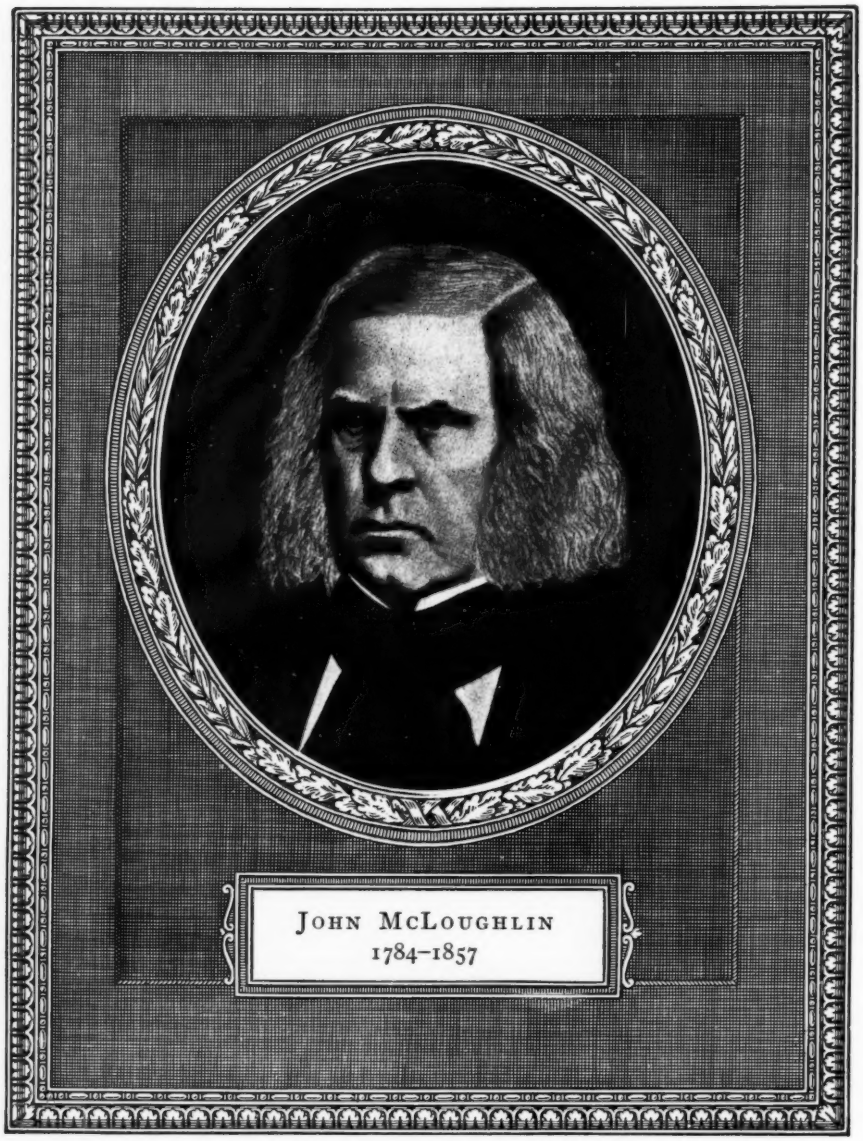
Chronic relapsing pancreatitis secondary to gall-bladder infections without jaundice, however, eventually may require cholecystectomy for cure; cholecystostomy affords relief only so long as there is drainage to the surface of secretions from the gall bladder, containing bacteria which have become acclimated to the pancreas, and reinfect it when external drainage ceases.

If the biliary ducts become infected, stones may form in the ducts, not the facetted stones such as form in the gall bladder, but rounded, disk, or cartridge-shaped, crumbly stones, composed of greenish-black bile pigments. Stones originating in the hepatic duct may drift down into the common duct from time to time, requiring repeated operations for the cure of the patient. I have seen several such patients who were cured after having stones removed from the common duct three times.

In cases of biliary cirrhosis of the obstructive type of Adami, caused by infections extending from the gall bladder to the minute ducts of the liver, prolonged drainage of bile to the surface with complete removal of bile tension by cholecystostomy sometimes initiates a degree of improvement which enables the patient to work in fair health for years. While not completely cured, at least he is not dead.

Walters, in his work on the pre-operative rehabilitation of the blood of the jaundiced patient, brought out a fact of great importance. He found that a higher mortality followed cholecystectomy with removal of stones from the common duct in the jaundiced patient than cholecystostomy, and that, in 58 per cent of jaundiced patients who died following combined choledochotomy and cholecystectomy there was too much blood in the abdominal cavity, not always enough to cause death, but sufficient to be a contributing factor. The blood pressure in the portal circulation normally is only 30 millimeters, in the general circulation approximately 130 millimeters. In the jaundiced patient the back pressure of the obstructed portal circulation causes prolonged and perhaps fatal continuation of hæmorrhages, owing to slight traumatism of the liver, which, in the non-jaundiced patient, would have no significance.

W. J. Mayo.



JOHN MCLOUGHLIN
1784–1857

MASTER SURGEONS OF AMERICA

JOHN McLOUGHLIN

"Father of Oregon"

SURVEYING the surgical field in America exhibits a striking picture that best reveals the history of the surgical forces that have played an important, if not controlling, part in the development of American nations.

The history of surgery in the northwest is forever linked with the growth and progress of the west. The surgeon accompanied the fur traders and were among the first to enter this vast unknown region. They witnessed the transformation of our American deserts and forests and Canadian prairies into healthful and flourishing commonwealths.

There are few chapters in the history of surgery more interesting than those which record the pioneer work done by the surgeons of all parts of America, and none more fascinating than the niche made by Dr. John McLoughlin, one of the unique characters of our great northwest.

John McLoughlin was born October 19, 1784, in Canada, about one hundred and twenty miles below Quebec. His father was John McLoughlin, a native of Ireland, who was accidently drowned, leaving seven children. John and David were the only boys. Their only maternal uncle was Samuel Fraser, M.D., who was doubtless a factor in both boys becoming interested in medicine. David loved the sea and after graduation joined the British Navy. John was educated in Canada and Scotland. He loved the woods, rivers, and rolling prairies. It was doubtless the same spirit that lured Dr. Wilfred Grenfell to a life of sacrifice in far-off Labrador. It was the same spirit that prompted Dr. William Beaumont to buy and borrow his patient, St. Martin, and travel from country to country in the interest of pure science.

Dr. McLoughlin had an impressive personality, physically perfect, his very presence blending to an atmosphere of culture, a well shaped head and face, a mouth, the mark of indomitable courage, lips that softened and whispered words of encouragement to the sick and needy. However, we are told that at Fort Vancouver, Dr. John McLoughlin lived and ruled in a manner befitting the chief of the western empire, but always with a graciousness and courtesy becoming a man of his profession and representative of the Hudson Bay Company.

He was brave and fearless and was absolute master of himself and those under him. He put a stop to the sale of liquor to the Indians. There were no Indian wars in the Oregon country during the entire period of McLoughlin's administration from 1824 to 1846. Dr. McLoughlin founded the first hospital of the great northwest. He provided food and shelter and gave surgical attention to thousands of sick and helpless. His benevolent work in this hospital was confined to no church, sect, or race of men but was as broad as suffering humanity. In one corner was a patient, a trapper, who had lived close to nature for years, hunting and fur trapping among the mountains, valleys, and streams. Recently, while on duty as a trapper and also as a soldier, protecting the settlers and immigrants from the savages, he had been wounded. His wounds were dressed and he was resting comfortably in the shed, slab covered hospital of the wilderness. In another corner was an Indian mother and by her side, her little child, the only survivors of a once populous Indian village. The recent epidemic of influenza, that brought sorrow and suffering to nearly every home, can be compared to the epidemic of 1829, according to Snowden, which, supposed to be the ague, broke out among the Indians along the Columbia and for three or four succeeding years, raged with peculiar virulence. It is reported to have been more fatal among the tribes than even the smallpox had been. During the first summer after the disease, in some of the villages there were not enough living left to bury the dead. Those already afflicted fled to the sea coast, abandoning the dead and dying to the birds and beasts of prey, some of the villages being entirely deserted. Canoes were drawn up on the shore, fishing nets were abandoned where they had been left, spread upon the trees to dry and all the houses were left tenantless. The dogs were left, but no other living thing gave evidence that the place had been inhabited. Here among the poor, the injured and afflicted with pestilence, worked John McLoughlin.

His diagnostic and surgical ability were eclipsed only by his ability as a statesman. When the bar sinister of propaganda caused discontent among the fur trading companies and disputes arose relative to the boundary line between Great Britain and the United States and war seemed inevitable, it was then that Dr. McLoughlin put out the smouldering flames of hatred, and peace was happily restored.

It was by common consent that he was the first governor of the North Pacific Coast. He endeared himself to the Indian and was always considerate of the red man's feelings and rights. He never forgot that, though the skin of the savage happened to have a tinge of copper, this did not pigment the soul. By example, patience, and kindness, he taught, above all, that he was a gentleman in whose heart was knightliness and honor.

However, as one reviews this romantic life of service and sacrifice, and gets a more vivid exhibit of the facts, it is apparent that he had his share of sorrow which

is one of the critical tests of life. It was Robertson who said, "Sorrow is not an accident occurring now and then. It is the woof which is woven into the warp of life and he who has not discerned the divine sacredness of sorrow and the profound meaning which is concealed in pain, has yet to learn what life is."

The Oregon Donation Land Law took away his land claim and left him in poverty, and he died, grief stricken, of a broken heart. Five years after he was laid in his grave an act of tardy justice was done at last to the memory of this man who went down in sorrow to his grave.

It is but a brief span of years since this intellectual giant of his time, who now sleeps where rolls the Oregon, left us with a surgical and professional heritage to which we should aspire. And what honors can we do him? We might profit by the example of the great state of Oregon, which restored the name of Mt. McLoughlin to one of its most sublime snow-capped mountains in the southern part of the state. Today we enroll him among America's greatest surgeons.

What Archbishop Ireland said of the church in the northwest might well be said of Dr. McLoughlin: "Behold the stately pine, solitary in its towering height. Its fellows that once with it beautified the forest have fallen one by one around it that the trees of later germination may measure from it to what growth they themselves should aspire."

The example given us by this pioneer surgeon, statesman, and benefactor, who was always producing something for the benefit of others, handicapped as he was by place and conditions of his time, is an inspiration to the medical student, to the young surgeon, and to ourselves. Let us keep close to the trail, lest we get lost in this modern age of commercialism and lose the scientific spirit, upon which our work depends.

Oh, great hearted fur trader, explorer, surgeon, statesman, and Father of Oregon! The immigrants and the Indians who had learned to love and trust their great white faced master, as he was known among them,—in fact the whole little nation along the Columbia wept when he died and felt that their little world was more lonesome when John McLoughlin went on his last call.

JOHN B. McNERTHNEY.

TRANSACTIONS OF SOCIETIES

CHICAGO GYNECOLOGICAL SOCIETY

REGULAR MEETING HELD JUNE 15, 1923, DR. HENRY F. LEWIS, PRESIDING

HÆMOLYTIC STREPTOCOCCI AND THEIR RELATION TO PREGNANCY AND PUERPERIUM

DR. A. E. KANTER (by invitation) read a paper on the relation of hæmolytic streptococci to pregnancy and the puerperium (see p. 96).

DISCUSSION

DR. RUDOLPH W. HOLMES: It would be a mistake to allow Dr. Kanter's paper to pass without discussion. A generation ago pueperal sepsis was considered to be invariably the fault of the physician. This opinion obtained from the dawn of the antiseptic era down to the beginning of this century. Now we know definitely that infection is very largely the consequence of an autogenous bacterial contamination. Since the influenza epidemics, puerperal infections are more prevalent due very largely to the above explanation. To what degree infections are due to the doctor and nurse, contaminated as they may be by some focal infection in themselves, is a moot question. Certainly, breast infections have been seen more frequently since the epidemics than in all the years of practice before.

I cannot concur with Dr. Kanter's statement that instrumentations, vaginal examinations, are no menace to the women. A physician with a conscientious regard to asepsis will have a minimum of infections but the risks are invariably present nevertheless. The man who practices a method of routine operative interference will have a higher morbidity than he who practices rational conservatism. I have shown graphically that practically all cæsarean sections have a postoperative thermal disturbance for 2 to 4 days, which illustrate the above point.

The method of slopping, seen in so many operating rooms, in the preparation of women for labor, allowing water to run down the labial cleft and, perhaps, into the vagina, is a fruitful source of contamination.

A great desideratum is to develop a technique which will be a ready test for relative immunity before an operation, or before labor. If this comes we certainly will have developed a means of artificially securing such immunity. When this comes we will have parturition and operations robbed of the dangers of sepsis.

DR. GILBERT FITZ-PATRICK: I wish to support Doctor Holmes in what he has said relative to the care and preparation of patients. Prior to going into the late war service I had discontinued vaginal preparation for delivery, using clippers instead of having the patient shaved. But that is not always possible except where the clinic is definitely under one's control.

I saw a very interesting case this spring in which elevation of temperature was present 48 hours before delivery. The second day after delivery cultures from the cervix and the uterine cavity were made using the Doederlein method for the purpose of securing a pure culture. The pneumococcus organisms were found. Blood cultures were negative. The temperature did not come down to normal at any time until the twenty-third day, when a shower took place in the right arm. The organisims found were identical with those found in the uterus. There were no vaginal examinations prior to delivery, which was spontaneous after 2 hours of labor. Multiple incisions with through-and-through drainage resulted in a cure. The temperature remained normal after the arm was opened.

DR. HOLMES: When I was an interne in the Presbyterian Hospital, in 1894, it was the vogue to give a woman a vaginal douche every 2 hours during the labor; an intra-uterine douche immediately postpartum; and vaginal douches every 4 hours for a week postpartum. With the consent of Dr. A. C. Cotton, I stopped douching as a routine, to the benefit of the women.

DR. DAVID S. HILLIS: If we abolish preparation of the external genitalia before delivery, we must cast aside all of the accepted surgical principles. Every confinement case is a surgical case, and potentially a major surgical case. If we were to be assured that every case would deliver spontaneously, without perineal injury or vaginal examination, we might safely omit surgical preparation. It has been observed that cases delivered unattended, on the way to the hospital without previous preparation, frequently developed fever in the puerperium. This was probably due to the fact that formerly these patients were shaved and scrubbed after the delivery. Since such cases have been allowed to go through the puerperium without external preparation, the incidents of fever have not been so frequently noted.

DR. KANTER (closing): I think Dr. Holmes has the right idea that in most of the cases of puerperal sepsis the infection is autogenous provided you do not use auto-infection in the strict sense of the word.

In the essay all puerperal infections were held exogenous when the bacteria were brought to the uterus through the blood stream or by extension from a diseased tube or ovary. The difficulty in the bacteriological study of puerperal sepsis is that on the fourth day of the normal puerperium, it is possible to find in the uterus bacteria similar to those found in the vagina during pregnancy.

EXPERIENCE WITH ONE THOUSAND CASES OF ABORTION

DR. DAVID S. HILLIS discussed his experience with one thousand cases of abortion (see p. 83).

DISCUSSION

DR. WILLIAM C. DANFORTH: The statistical studies such as Dr. Hillis has made are very favorable, particularly when they concern matters so closely connected with our daily work. This study brings out one important point, which agrees with my own experience, that serious hæmorrhage from early abortion is rare. When we consider that fact together with the work of Curtis on bacteriology of the corporal endometrium, it would seem that one should await a definite indication before invading the uterine cavity, knowing that by so doing bacteria must almost inevitably be carried therein.

Secondly, Dr. Hillis' study brings out the fact that intelligently conservative treatment of abortion yields good results. Observation of our own material has convinced me that his conclusions are correct. I wish that facts brought out by studies of this sort were more generally known and appreciated by physicians. While caring for an infected abortion by the conservative method, the employers of the patient desiring what they thought to be a more rapid mode of treatment to be used, I have recently had the experience of having them consult six general practitioners, all of whom informed them that immediate curettage should be carried out.

Evidently some education along this line is still necessary. Such carefully considered studies as that of Dr. Hillis are of the greatest value.

DR. RUDOLPH W. HOLMES: Dr. Hillis must be complimented on the colossal work he has done in tabulating 1000 cases of abortion. Unless one has done such tabulation on a small scale, he cannot appreciate the enormous number of hours his work has entailed. I can heartily agree with him that the principal indication for emptying the uterus during the progress of an abortion is hæmorrhage; sepsis alone should not be held to be an indication for artificial evacuation of the uterus.

I am particularly interested in the fact presented that of his 1000 women 224, or 22 per cent, gave the history of a criminal induction. For many years I have felt that criminal interruptions are almost as frequent as those from all other causes of abortion combined. If the truth were known, I am sure many more of Dr. Hillis' cases would have been in the class of criminal.

Of Dr. Hillis' cases of criminal abortion 7.5 per cent died. This is not high considering the types of patients admitted to the County Hospital. During the years I was chairman of the committee on abortion of the Chicago Medical Society, our members agreed that 1 to 2 per cent was a conservative estimate for the death rate for criminal abortion, this, in view of the fact that most invariably the abortionist does his work in a slovenly if not septic manner. Over and over again during our investigations on the abortion evil we convinced ourselves that the physician who did the popularly called "live saving operation," that is, the curettage, was more responsible for the death than the abortionist himself: this did not minimize the responsibility of the abortionist, for he is responsible for the consequences of his illegal act. When the day comes when we may instill into the minds of the general practitioner that curettage is the last thing to think of in a case of puerperal sepsis, instead of the first, then we shall have a great diminution of the death rate in abortion. We would accentuate Dr. Hillis' statement that the presence of fetal contents in the uterus is not an indication for an evacuation of that uterus; hæmorrhage alone should be the guiding indication.

DR. CHANNING W. BARRETT: I have had 6 years' experience in the same line of work which Dr. Hillis has covered in his statistics, and from that 6 years' work I can say that cleaning out the uterus is not so dangerous and not fraught with such serious consequences as Dr. Holmes would lead one to think. I think the abortionist should be held responsible for his acts; I do not think the fact that there are doctors careless enough to rip open the uterus from one end to the other should mitigate against proper treatment being carried out in a given case. If it is good treatment to allow the uterine contents to remain in the uterus indefinitely, why need we have so much trouble with women who have weak hearts or kidney trouble, and need therapeutic abortion? All we would have to do would be to run a sound into the uterus and let them pursue the safe course of getting rid of their abortion. As a matter of fact, women with kidney trouble or with lung and heart lesions, who have to have an abortion can be dealt with very safely by emptying the uterus. The trouble is that these cases are usually very much neglected and are treated by the old-fashioned doctor. The patient is prepared surgically for operation; she is put upon the table, the uterus is dilated and emptied, she is put back to bed, and we feel safe about what we have done. If that is a safe procedure in a woman who is below par, it seems to me we should deal with her abortion by emptying the uterus. This should be done in such a way that it does the least possible damage to the organ, and in as safe a manner as possible. The very nature of the growth of the ovum in the uterus makes it not ready for good separation at 2 months, at 3 months, or even 4 months. If separation does occur during this time there is a great tendency for some of the mater-

ial to be left in, and when this material is left in it becomes septic. When it becomes septic, the best possible way to have the uterus do well afterward is to empty its cavity without doing a lot of damage to the organ. The foreign material can be gotten out with thorough curettage without ripping the uterus from one end to the other.

The statistics of Dr. Hillis indicate that there is quite a number of cases that do not go wrong even when material is left in the uterus. It is also stated that some of them do go wrong. Most of those patients could have been started on their way to recovery by going in at the end of 5 days if the curettage were done carefully. I say that with due regard for the splendid showing in this series of cases.

DR. EMIL RIES: A great many years ago I quit the practice of obstetrics, but while working at the Michael Reese Hospital in a department to which all cases of abortion were assigned, I took special interest in the treatment of abortions in their natural and unnatural course.

In my experience as interne I had passed through a period of active treatment with very poor results and had turned to very conservative ways before 1894. I have had no cause to change my attitude and am teaching the conservative method today.

This treatment was carried out in my service at Michael Reese Hospital and at Post-graduate Hospital and I have read a report on it before this Society and published it in SURGERY, GYNECOLOGY and OBSTETRICS. You may find the results there.

Now, it would not be right to enter into such a discussion as we have had tonight without mentioning Winter, who started this discussion anew all over the gynecological world. Also it would not be right to discuss this subject without considering what the gynecological literature of the world presents today, though there never was such a muddle as long as I can remember. We have the same kind of statistics in every issue of the *Centralblatt* and the *Archives*, in the French periodicals, the English and American periodicals. We have the same kind of statistics in all of them. And one man concludes that conservative treatment is the best. Another man says and supports it by statistical evidence that curetting is the best treatment for abortion, and in the last few papers I have been studying the authors have come to the sensible conclusion that the question cannot be solved by statistics at all.

Tonight Dr. Hillis concludes from his statistics that conservative treatment is the best and he takes exactly the position I do. And then I hear Dr. Barrett say that according to his results active treatment is correct. There must be something wrong with the statistics, and I wish some one would tell me what.

DR. GILBERT FITZ-PATRICK: What has been said simply proves the trend of medicine and teaching of medicine during the last 25 or 30 years. We are treating the disease instead of treating the patient. We are still trying to develop a treatment which will fit every patient, that has always proved to be totally impossible. The probabilities are in the final analysis that the end-results are dependent upon the personal equation of the patient, provided the treatment and management is founded upon a thorough knowledge of the case in hand.

DR. HILLIS (closing): I have three cases in mind from the service of the County Hospital which were being treated conservatively, the temperature curve was gradually going down and a general improvement was in progress, when urged by very anxious friends they were taken out of the hospital, curetted the next day by some outside doctor and all died within 3 days.

DR. RIES: And you got the blame?

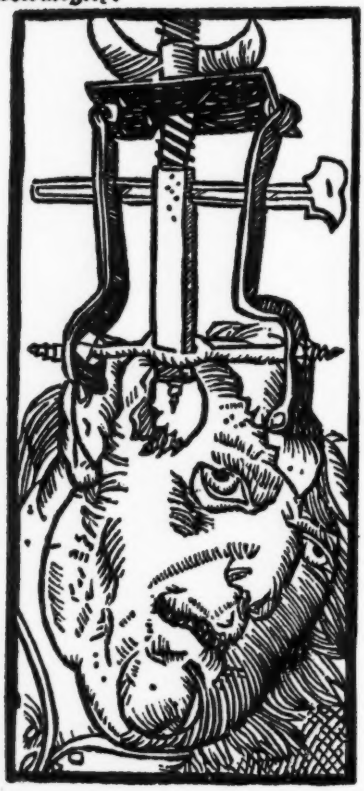
DR. HILLIS: Yes. That element of danger mentioned by Dr. Holmes, namely, unintentional injuries to the uterus during curettage, is of less importance, in my opinion, than the effect of a curettage skillfully done. The criminal abortionist introduces the infection into the uterus and the doctor who curettes afterward, although he may be extremely skillful in the use of the curette, spreads the infection further into the deeper tissues, and probably the more skillful he is the more harm he will do. He trys to remove all the infected material and the bacteria with the curette, which is impossible. In my opinion, he may do as much harm as the man who tears the uterus from the fundus to the cervix.

Although it is true that nothing can be proved by statistics, it would seem probable that a comparison of the results under extreme conservatism and with treatment carrying out active local measures would give some indication of a relative value of these two methods, provided, of course, the cases are in large series and honestly reported.

I agree with Dr. Fitz-Patrick that it is desirable to treat the disease instead of the patient. It is obviously and certainly impossible and undesirable to treat all cases by rule, but in the present state of the abortion question, upon which there is so much difference of opinion, it is desirable to determine if possible by experience which plan of treatment yields the best results, and which plan will do the least harm. I think our position with regard to this condition is something like this: We know that we can curette some cases and the patients will promptly get well; we know that if we curette others, they will promptly die, but we do not know which ones we may safely curette and which will be harmed by curettage.

Since we cannot determine beforehand clinically, or by means of the laboratory, what to do with these cases, experience with a given method of treatment is all we have left to solve the problem. Figures in this paper are as accurate as they can be made. They seem to point in one direction; that is, good results can be obtained by a rather extreme conservative method of treatment.

¶ The noble experyence of the vertuous handy warke of surgery/practysyd & compyled by the moost experte mayster Jherome of Bruynswycke/borne in Straelsorowe in Almayne/ þ̄ whiche hath itfyrst proued/and trewly founde by his awne dayly exercysynge. ¶ Item there after he hath authorysed and done it to vnderstande thrugh the trewe sentences of the olde doctours and maysters very experte in the scyence of Surgery/As Galienus/Ypocras/Auicenna/Guydo/Haly abbas/Lanckrancus of mylen/Jamericus/Rogerius/Albucasis/Placentinus/Brunus/Gwilhelmus de saliceto/& by many other maysters whose names be wrytten in this same boke. ¶ Here also shall ye fynde for to cure & hele all woundedmẽbres/and other swellynges. ¶ Item yf ye fynde ony names of herbes or of other thynges wherof ye haue no knowlege/ þ̄ shall ye knowe playnly by the potecarys. ¶ Item Here shall you fynde also for to make salues/plasters/powders/oyles/and drynkes for woundes. ¶ Item who so desyreth of this science þ̄ playne knowlege let hym oftentymes rede this boke/and than he shall gette perfyte vnderstandynge of the noble surgery.



THE SURGEON'S LIBRARY

OLD MASTERPIECES IN SURGERY

By ALFRED J. BROWN, M.D., F.A.C.S., Omaha, Nebraska

THE SURGERY OF HIERONYMUS BRUNSCHWIG

THE noble experyence of the vertuous handy-warke of surgeri, practysyd & compyled by the moost experte mayster Iherome of Bruynswyke, borne in Straesborowe in Almayne, ye whiche hath it fyrst proved, and trewly founde by his awne dayly exercysynge. Item thereafter he hath authorysed and done it to understande thrugh the trewe sentences of the old doctours and maysters very experte in the scyence of Surgery, As Galienus, Ipocras, Avicenna, Gwydo, Haly abbas, Lancfrancus of mylen, Iamericus, Rogerius, Albucasis, Place(n)-tinus, Brunus, Gwilhelmus de saliceto, & by many other maysters whose names be wryten in this same boke. Here also shall ye fynde for to cure and hele all wounded me(m)bres, and others wellynges. Item yfe ye fynde only names of herbes or of other thynges whereof ye have no knowledge, yt shall ye knowe playnly by the potecarys. Item here shall ye fynde also for to make salves, plasters, powders, oyles, and drynkes for woundes. Item whoso desyreth of this science ye playne knowledge let hym oftentymes rede this boke, and than he shall gette perfyte understandynge of the noble surgery."

Jerome, of Brunswick, was an Alsatian army surgeon who was born about 1450 and died in 1533. The English edition of his work bearing the above title reviewed from the excellent collection of Dr. LeRoy Crummer, of Omaha, was printed at London in Southwark by Peter Treveris, March 26, 1525, and has the distinction of being the first illustrated work on surgery printed in the English language. The German, or first, edition was entitled "Dis ist das Buch der Cirurgia. (Hantwirchung der Wundartzney), 1497, Strassburgk, von Hieronymo Brunschwig."[1]

In his prologue Jerome warns against the barber surgeons and offers advice to students and young surgeons which is of as much value today as then.

The work itself may be divided into three parts. The first, as is usual in the majority of old surgical works, is a review of the then known anatomy of the body, and the necessity of a comprehensive knowledge of anatomy is stressed in the prologue. The second part includes the surgery proper. Being the work of an army surgeon, it deals with wounds, fractures, and dislocations only. His account of gunshot wounds is the first detailed account in medical literature.[2] Preceding each of the three divisions, wounds, fractures, and dislocations, is a description of the treatment of the condition in general. Then follows the classification of the various types of each and a description of the treatment applicable to each type. The suture of wounds is carefully described and several forms of suture noted. Hæmorrhage is also spoken of, and, though the ligature of vessels is usually attributed to Paré, Jerome describes it accurately and states, that, when feasible, it is the best way of combating hæmorrhage, reserving other methods such as pressure, styptics, and cautery for oozing wounds. As this book was published in the German edition before Paré was born, it is probable that Jerome, through his study of former authors, rediscovered the method and Paré later applied it to the treatment of vessels in the amputation stump and popularized it. He says: "The fourth maner is that somtyme a stychynge or festynynge happeneth for to stau(n)che blode and that is when ye se a vayne blede sore as the vayne of the neck or ye wou(n)ded betynge vayne[3], thrust that v a y n e through with the nedyll and after the nedyll knet the vayne fast with ye threde that is in the nedyll & then drawe the nedyll through and let an ende of the threde byde ha(n)gynge at it a certain dayes tyll that upper part of the vayne doth putrify and that ye thred go out by hymself." He warns against leaving dead spaces in sutured wounds and advises against allowing wounds to heal before suppuration and pain have disappeared. In the same general way fractures and discolations are taken up and classified. Many interesting pieces of apparatus for the reduction of deformity and immobilization of fractures are illustrated. A study of these shows plainly that the general principles of reduction and immobilization of fractures were well understood by the author. The third division of the work, the antidotharium, describes in detail the method of making plasters, ointments, etc., recommended for use in the text.

Jerome, of Brunswick, was evidently one of the foremost surgeons of his time. He refers in his work to the masters of previous periods and was evidently a student. Reading of his work shows him to have been a most careful observer and a clear thinker who was able to draw deductions from his observations which were far in advance of his time.

[1] History of Medicine, Baas, translated by Handerson, p. 307.

[2] History of Medicine, Garrison, p. 186.

[3] Beating vein=artery.

REVIEWS OF NEW BOOKS IN SURGERY

THE average medical man's knowledge of diseases of the colon and rectum is exceedingly limited. For the past few years there has been quite a stimulus offered by various men for more thorough study of those diseases which involved the colon, and at the present time it is pleasing to note that the various types of colitis are receiving their more or less deserved attention.

There is no doubt that many individuals have been operated on and their appendices removed, when their real trouble lay in the colon, and the patient received only the devitalizing effects of the operation and continued to carry his malady with him. The practice of proctology for many years was in the hands of charlatans. These men, by some unique maneuver, about the anus, pretended to cure everything from epilepsy to gastric ulcer. A few men had the courage to take up the subject of proctology and the diseases of the colon, and after a prolonged and conscientious study have compiled information which is invaluable to the medical profession. They have taken this subject from the hands of the charlatans and have placed it upon a sound scientific basis. Probably no other one man is more deserving of credit and praise than Gant. In a recent three volume edition the author attempts to place before the reader a classic study of the diseases of the appendix, colon, rectum, and perianal region.[1] This is not a revision of any previous work, but is a new work with new illustrations, photographs, X-ray reproductions, etc.

There is given a more or less detailed description of the anatomy of the parts, which is of value not only in making a diagnosis but in operative treatment. The author describes with considerable detail his method of local anæsthesia in work about the anus and advises its use in selected cases. It would seem that this alone—namely, that many conditions about the anus, chief of which are hæmorrhoids, can be operated on without general anæsthesia and with very little postoperative discomfort and disability—is a great stride in the right direction.

He gives a very lengthy description of those diseases of the rectum, anus, and perianal region which may be encountered. It is rather disappointing, however, that in many instances the symptomatology is quite confusing. A little more brevity and a little better choice of words would be quite gratifying. The subject of carcinoma of the rectum is taken up in detail, and here again the author has missed his point. If carcinoma is to be cured, the diagnosis must be made early, and it is the reviewer's impression that the author lays entirely too much stress on cachexia in the differential diagnosis between benign and malignant growths of the rectum. Cachexia is generally a late symptom in any carcinoma and above all else, in rectal carcinoma. It can be readily seen why 60 per cent of all cases of carcinoma of the rectum come to the surgeon inoperable. We depend upon such men as Gant and others to present to the medical profession those findings which will enable them to make a diagnosis of cancer in such an accessible part early enough to be removed with a certain surety of success without recurrence. The reviewer would like to have seen in this treatise some definite statements made in regard to early diagnosis of carcinoma of the rectum. We must look to the men who are students, thoroughly trained scientists, and who have an extensive clinical experience, to give to the profession absolutely authoritative technique. These men must have the courage of their convictions and in spite of the fact that their stand may appear radical, yet in no other way can so big a thing be accomplished.

The subject of colitis is covered in a very thorough manner but here again in many instances the author is not explicit either in symptomatology or in the line of treatment that he himself advocates in the individual cases. He may know what line of treatment he would institute in the individual case, but in many instances his text is quite confusing, and it is left to the discretion of the reader to choose his form of treatment. In many instances that would not give the desired results.

This work contains an enormous amount of information, so arranged, however, that it lacks clarity, much of the value thereby being lost. In addition, though certain portions are admirably written, sufficient stress is not laid upon essentials.

AT no time is one's surgical ability put more to test than when he is confronted with some emergency condition in which the diagnosis is doubtful, and in which the course of surgical procedure is in question. One need only to have in mind acute injuries to the head, injuries to the lungs, and certain acute abdominal conditions, to realize to what extent a life may depend upon the judgment of a single individual. It is true that probably in many conditions a surgical operation is necessary and that an exact diagnosis is not essential. This applies especially in acute abdominal conditions. Yet in this very phase of surgery, there is a certain number of acute abdominal catastrophes in which it is better judgment to postpone operation than to invade at once.

It is, therefore, of more than casual interest to receive a re-edition of the work of Lejars.[2] This is an English translation of the eighth French edition, and the author has but very little deviated from his former attitude. He has incorporated in this new

[1] DISEASES OF THE RECTUM, ANUS AND COLON. By Samuel Goodwin Gant, M.D., LL.D. Vols. i, ii, and iii. Philadelphia and London: W. B. Saunders & Company, 1923.

[2] URGENT SURGERY. By Felix Lejars. 3d. English ed., translated from 8th French ed., by William S. Dickie, F.R.C.S., and Ernest Ward, M.A., M.D., F.R.C.S. New York: William Wood and Co., 1923.

work those principles and lessons taught us by the war, particularly those in regard to visceral injuries and extensive wounds of the soft parts. Those who are not familiar with the work of Lejars will do well to heed the teachings of this master surgeon. The text is arranged in a very satisfying manner. The author discusses wounds and acute processes of the various regions, beginning with the head, and continuing through the neck, thorax, spine, abdomen, etc. Many conditions are exemplified by case records in which there is noted the history of the patient, the method and reason for making a diagnosis, and the reasons for or against immediate operation and the findings.

The author apparently has great faith in the infusion of saline solution, and to this American surgeons will probably under certain conditions take exception. Not that the American surgeons do not realize the great benefit and in many instances the absolute necessity of saline infusions, but in those cases in which there is a hæmorrhage in process and before it has been checked, the average American surgeon will refrain from using intravenous salt solutions. Probably in only one other instance does the author's methods differ from those accepted in America—namely, in treatment of infections of the hand. Here it would seem to the student of surgery of the extremities that he does not conform entirely to anatomical and physiological principles.

With all, this is probably one of the most instructive volumes of its kind in print today. The author shows evidence of a very ripe experience and very mature judgment. His methods of making diagnoses and his utter fearlessness in many instances, give him results which are more than could be hoped for. His manner of expressing his thoughts and his mental calculations in making diagnoses, are exceptional. No surgeon who is called upon to treat emergency cases, especially of the major type, should fail to study this work.

THERE seems no question but what more and more surgical operations are being performed without general anæsthesia. Two sides may be taken on this question. There is no doubt in the reviewer's mind that many surgical procedures should be carried out under local anæsthesia; furthermore, that there are many surgical procedures that can be carried out under local anæsthesia, in which the individual indications must be judged by the operator at the time the operation is to be performed. The question arises whether the mental anguish and exhaustion subsequent to an operation performed under local anæsthesia is not as devitalizing in certain neurotic individuals as general anæsthesia. There is no question but what the average surgeon minimizes the psychic factor in his patient and that he boldly performs an operation not necessarily causing a great deal of physical pain but enormous mental distress, and that this may be as destroying to the individual as certain postanæsthetic pathological conditions.

Farr[1], in his recent work, attempts to correlate these two factors in his so-called psycho-local anæsthesia. In this work the author gives the reader his own impressions on the subject of local anæsthesia as he has observed it in his own practice and operations, and since his experience has been enormous it is well worth while for the average surgeon to read his teaching. The text is divided into three parts. The first six chapters are devoted to certain problems to be considered in connection with anæsthetic equipment, and a description of the sensory nervous system. The second part, consisting of five chapters, considers regionally all portions of the body except the abdomen, and in the third part, surgery of the abdomen is covered.

In the author's discussion of regional surgery, the technique of local anæsthesia is correlated with that given in previous chapters in which the subject is discussed in a rather general way. Many illustrations are used to guide the reader in forming a more accurate conception of what the author has in mind. In many instances the topic is illustrated by case records and actual photographs.

Many operating surgeons will be astounded to note the scope covered by the author in his operative work under local anæsthesia, as, from his text, one is allowed to believe that any surgical procedure can be carried out successfully under local anæsthesia without pain or discomfort to the patient. If such is the case, then by all means the subject should be more thoroughly studied by the average surgeon. We must all realize that a general anæsthetic carries with it not only the danger of an immediate mortality, but the possibility of those postoperative hazards, such as lung infections, heart complications, and renal and liver insufficiencies. Therefore, if local anæsthesia offers us a method whereby a surgical procedure can be carried out without pain and without too great a degree of psychic shock and with minimum danger of postoperative complications, the surgical profession should be obligated to put this procedure more generally into use.

TO those who are interested in contributions from the Mayo Clinic, the collected papers for 1922, just received, will be welcome.[2] As usual, the papers included in this volume deal with diseases of practically every region of the body. It is very pleasing to note the conciseness of the majority of the articles, most of them being brief, very clear and to the point.

There are eighty-seven contributors to 142 articles in this volume. One cannot help but be amazed at the tremendous amount of work done in this institution covering the ordinary routine clinical work, which is carefully studied, as well as research and experimental work.

[1] PRACTICAL LOCAL ANÆSTHESIA AND ITS SURGICAL TECHNIQUE. By Robert Emmett Farr, M.D., F.A.C.S. Philadelphia and New York: Lea & Febiger, 1923.

[2] COLLECTED PAPERS OF THE MAYO CLINIC. Edited by Mrs. M. H. Mellish. Vol. xiv, 1922. Philadelphia and London: W. B. Saunders Company, 1923.

Practically all of these papers have appeared in some journal, and probably the average surgeon has either heard or read a certain number of them. To those men who respect careful study and who wish to have at hand a collection of most interesting papers, which are based on sound scientific facts, this volume offers an opportunity. The majority of the papers deal with practical conditions. There are also articles which will appeal to those more inclined toward progressive medicine; namely, the articles by Mann and Magath on studies of the physiology of the liver, and the effect of total removal of the liver after pancreatectomy, also the work of Rosenow on the production of urinary calculi by the devitalization and infection of teeth in dogs with streptococci from cases of nephrolithiasis.

A review of this book is impossible. It need only be said that the volume contains papers of unusual interest and of unusual value, and for those men who are inaccessible to medical societies and to the current journals, the book offers a collection of papers of thorough scientific value.

THE little volume by Finsterer[1] will be of decided interest to the abdominal surgeon. The author tells, in no mistaken terms, his reasons for the use of local anæsthesia. He condemns general anæsthesia on account of the frequency of lung, heart, and liver complications, and with the technique which he has evolved he is enabled to perform practically any intra-abdominal operation under local anæsthesia, without pain to his patient.

His technique varies with the operation to be performed and the more or less exact conditions found upon the operating table. He describes in great detail the infiltration of the abdominal wall and splanchnic anæsthesia as advocated by Braun and Kappis. Under certain conditions he has varied the technique to meet the individual demands. This technique is divided into three groups which he has designated as for "small" "middle size" (medium), and "large" or extensive operations.

In the first group, he includes operations such as gastrostomy, enterostomy, etc.; in the second group, hernia of various types, appendicitis, exploratory laparotomy; in the third group, he incorporates sixteen operations, which include the stomach, the duodenum, liver, gall passages, the intestines, rectum, the spleen, the kidneys and female adnexa.

In each of these groups he describes the technique of administering the anæsthetic for the individual case. In the division on gastric resections he describes the various operations which he himself employs, the reasons for using them and the results. His operations are decidedly radical and very extensive, but apparently his results are unusually good. His experience in abdominal surgery with local anæsthesia has been enormous and in spite of the fact that many of his principles will not be accepted by the average surgeon, either due to the fact that his physiological principles are wrong or that his technique is too radical, nevertheless much is to be gained by reading what this dexterous opertor has to say. His text is very clear, and he is most emphatic in stating his opinions. For those who can read German and who are interested in abdominal surgery and especially abdominal surgery under local anæsthesia, the reviewer very heartily recommends this little volume.

J. A. WOLFER.

[1] DIE METHODEN DER LOKALANÆSTHESIE IN DER BAUCHCHIRURGIE UND IHRE ERFOLGE. Prof. Dr. Hans Finsterer. Berlin and Vienna: Urban & Schwarzenberg, 1923.

AMERICAN COLLEGE OF SURGEONS

A SUMMARY REVIEW OF THE HOSPITAL CONFERENCE OF THE CLINICAL CONGRESS OF AMERICAN COLLEGE OF SURGEONS

By MALCOLM T. MacEACHERN, M.D., C.M., Chicago
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THE 1923 sessions of Hospital Conference of the Clinical Congress of the American College of Surgeons extended over two days instead of one, as in former years. The success attendant on this innovation justifies its continuance. Surgeons from all parts of the United States, Canada, South America, Mexico, Cuba, England, and Ireland, almost 3,000 in number, in addition to hospital executives, trustees, nurses, and others, attended the sessions at the Congress Hotel, October 22–23, 1923. The program covered four sessions, including two very interesting round table conferences, a symposium on hospital standardization, and a staff conference demonstration. Each session was attended beyond the limit of capacity of the hall, and it was plainly obvious throughout that the interest did not wane for a moment at any time.

The program was designed to deal with the details of hospital standardization, and precipitate discussion on difficulties and problems encountered. Every subject or topic had some bearing or other on the practical application of one or more of the principles involved in hospital standardization. The entire meeting took the form of a great "clearing house," so to speak, for the ever-growing movement of hospital standardization. The interest shown in and out of session was intense. The Hospital Standardization and Information Department was busy from 7:30 a.m. to 11 p.m. daily. It is estimated that over 2,400 interviews were held during the 5 days of the Congress. A splendid opportunity was thus afforded all present to see the work accomplished, so comprehensively shown in the exhibit: to consult with those in authority in regard to the difficulties encountered in promoting hospital standardization and to secure literature pertaining to the movement, which was given upon request. Through this department and the contact which it afforded, the officials of the College charged with the responsibility of hospital standardization, had a good opportunity to get much better acquainted with the hospital executives and surgeons, and it was very gratifying to the executives to find so much general interest in the movement.

Because of the lack of space, it is impossible to give the full proceedings of the conference, a complete report of which will be issued shortly. This article will attempt only to summarize the proceedings in a more or less inadequate manner.

The opening session on the morning of October 22 was presided over by the president, Dr. Harvey A. Cushing, of Boston. Dr. Franklin H. Martin, the director general, the first speaker, officially announced the list of approved hospitals up to October 22, 1923, which included all active general hospitals of fifty beds and more in the United States and Canada surveyed during the year and meeting the minimum requirements of the American College of Surgeons. A copy of this report was placed in the hands of each person upon leaving the hall later. It was gratifying to note that 1,176 hospitals (65.9 per cent) out of the 1,786 surveyed, met the minimum standard laid down by the College. He called attention to the fact that the sixth milestone of this great movement had been successfully passed and the seventh reached. It was a movement designed primarily to standardize surgery and the surgeon, but, because of its purpose, its all-embracing, practical, and sensible requirements and its recognized worth, the movement had spread inevitably to every phase of the medical profession in making hospitals more efficient and more scientific places in which to work and treat patients. A need was discovered by the College; a remedy was found to meet that need; the remedy was applied in a practical manner through this movement, which is ever increasing in momentum and permanency. The hospitals have willingly and in a solicitous manner taken to the program because "its requirements are reasonable, its methods of presentation acceptable, and the work of the hospital investigators,

because of the personal visits and the impartial manner of making reports, appeals to the hospitals as an honest, unprejudiced, disinterested effort to arrive at facts. Without ostentation this movement for hospital betterment has been its only propagandist. It has convinced the medical profession that a great event has been transpiring; that when two or more individuals get together in harmony, even in the profession of medicine, and pursue a course of self-betterment, the results are stupendous, the effect inspiring. Every hospital trustee, every superintendent, and every nurse of the North American continent have been drawn into the vortex of this movement and each one prides himself on his part in it. The public has been consulted by the hitherto exclusive profession of medicine and has been asked to share the responsibility of aiding the betterment of hospitals. Business men of large and small communities have learned that the profession of medicine can conduct its affairs in a business-like manner as well as wield the scalpel and administer drugs. One of the conservative philanthropic foundations, the Carnegie Corporation, after a thorough investigation of this program, for five years contributed toward its financial support to a suma ggregating $105,000. In addition to this a sum of $220,283.09, contributed by the College, represents a total expenditure during the five years of $325,285.09."

The value of hospital standardization to the small community hospital was most forcibly presented to the audience. Through this movement the hospital benefited in many ways, but particularly in the added stimulus for more scientific work and especially in promoting better co-operation and fellowship among the group of doctors attending.

A strong plea was made for follow-up work in hospitals. Without this we have no definite way of knowing what the results of treatment really are. This is the day when we want facts; facts that will guide us in future procedures and activities. These can come only from the study of end-results, a phase of work much neglected in most hospitals today. The value of a simple surgical rating system was demonstrated and submitted as a practical and necessary procedure in hospitals. A rating system of this kind may be defined as "a condensed expression of results applied and lending itself to comparison and summation." Through such a method as illustrated, we are able better to appraise surgical work in hospitals.

The problem of the interne is of great interest to all hospitals at the present time. A great deal of thought is being given to this question by competent committees, but no general recommendations have been put forth as yet. The present status of the interne question is possibly best indicated in the following extract, taken from the essayist's paper at the conference:

"In 1918 the American College of Surgeons started their campaign for standardization of hospitals which, although not directly dealing with the interne question, has indirectly considerable effect.

"In 1919 a tentative schedule of essentials in a hospital approved for internes was prepared and published by the Council on Medical Education and Hospitals of the American Medical Association, which has formed the measure by which hospitals could be judged as to whether or not they provided suitable training and teaching for internes, in return for their services in carrying on the work of caring for patients in the hospital. In the best hospitals most of these requirements had already been in force having been introduced by their staffs and managements in order to attract the best internes and in order to carry out the teaching function which was beginning to be accepted as an important part of a hospital's service to the community.

"This standard, similar in most respects to the minimum standard for hospitals prepared by the College of Surgeons, imposes no hardships upon the larger general hospitals, enumerating mainly what had already been found to be for the best advantage of the hospital, its patients, and internes. As applied to the smaller hospitals of from 25 to 100 beds the literal fulfillment of these requirements was often burdensome and difficult, but these difficulties were in most cases bravely approached by the hospitals and arrangements made which provided for the carrying out of the spirit of this standard.

"The essentials are: (1) There shall be an organized staff willing to assume the obligation of teaching internes by personal instruction and by monthly clinical conferences. (2) The hospital must have a pathological department, suitable laboratories, X-ray equipment and roentgenologist, library, and proper quarters for the internes. (3) Real records of cases must be systematically taken and properly filed under the care of a librarian. (4) The work of the internes must be regulated so that they will systematically take up history-taking, clinical laboratory work, X-ray, anæsthesia, maternity cases, necropsies, responsibility for the diagnosis and care of patients, surgical dressings, operations, etc. Without specifically so stating, it is suggested that,

where a non-rotating service is chosen, additional service be taken in a hospital that will supply any deficiency in training."

A review of nursing in the United States and Canada by two great leaders in the profession, showed comprehensively that great progress was being made to meet the demands of modern day civilization and development. Hereto the field is rapidly expanding, and many problems of mutual interest to the nursing, the hospital, and the medical professions were discussed.

A more particular consideration of hospital standardization in its different phases was presented in a well arranged program which may be taken up under the usual headings.

STAFF ORGANIZATION

From the addresses, papers, and discussions, it could be gathered that this phase of work is being more easily and satisfactorily carried on, though difficulties are still encountered, particularly in the securing of the right kind of staff conference and in the elimination of fee-splitting. In regard to the former, the staff conference, the solution lies in the following: (1) a full measure of co-operation among the doctors attending the hospital; (2) active, keen leadership, especially in chairman and secretary of staff; (3) an inherent habit or desire on the part of each member to present his experiences, not only for his own benefit but also for that of others; (4) the providing of an interesting agenda, supported by the pathologist and his findings, as well as the radiologist and other heads of medical departments in the hospital; (5) a frank, kindly, and constructive discussion of the work of the hospital. Fundamentally, there must be the belief that such meetings are right and worth while. There must be developed the honest, sincere, studious, searching spirit which, in the words of Father C. B. Moulinier, president of the Catholic Hospital Association, and an ardent worker for hospital standardization, will "find the facts," "filter the facts," "fix the facts," "focus the facts" on the patient, and "face the facts fearlessly."

Analysis of one hundred hospitals of one hundred beds and over, failing to meet the standard this year, showed that 57 per cent lacked the proper staff organization; 96 per cent had only a partial analysis of the work or none at all; and 64 per cent had not taken action against fee-splitting.

A staff conference demonstration by the Evanston Hospital staff, presented in a very comprehensive manner the practical carrying out of a good conference and was of intense interest and profit to all present.

CASE RECORDS

This subject received major attention during the conference and was very completely covered by a number of speakers with extensive experience and expert knowledge. The essentials for good case records, as gathered from the opinions expressed, may be summarized as follows: (1) a serious realization by all connected with the hospital that records are essential for its proper conduct; (2) all-round co-operation of the board of trustees, medical profession and hospital staff; (3) a record department well equipped and having good personnel that shows leadership, initiative and originality; (4) the securing of the record early, with all its logical, component parts. This may be accomplished in various ways: (a) the doctor writing it himself; (b) the doctor dictating it to the record clerk or through the dictaphone; (c) the interne writing it under the supervision of the doctor in attendance on the case. The best record is the one conscientiously produced by the doctor himself who should supervise the production of the same, no matter how obtained. The record clerk is an invaluable adjunct in the securing of records and all hospitals should have such an official. (5) The proper filing of records. The filing of records is important from the standpoint, not only of ready reference, but for scientific purposes. All hospitals should have well organized filing systems. At first these may be simple but gradually they build up into a well amplified system.

Interest and leadership as demonstrated by the speakers on this occasion are necessary for good records in any hospital. Example should be taken from two of the leading surgeons who addressed the conference on this subject.

One of the essayists on the program, dwelling at length and in a masterly way on the difficulties in securing records, enumerated the following eight in number: (1) "Lack of knowledge of board of trustees as to the real value of records and consequent lack of proper financial support for a record department. This can be overcome by an educational campaign on the part of the superintendent and the staff who should lose no opportunity to convince the board. (2) A dearth of educationally trained record librarians. This can be lessened by standardization of the qualifications and requirements for the position. (3) Lack of co-operation on the part of the staff. This can be largely solved by the creation of a committee on records. (4) Non-conformity of

nomenclatures. Here the remedy is a paraphrase of Chief Justice Chase's terse statement 'the way to conformity is to conform.' (5) Worthlessness of most statistics. Meaning can be put into these only by completion of records from day to day. (6) Poor quality of records. Emphasis on this at staff meetings is the only means of producing results. (7) Slight use made of records. This can be encouraged by the compilation of data in good form for scientific purposes, the medical society meetings, the working up of practical subjects by doctors for presentation in paper or essay form, the compiling of data for annual reports, and in many other ways. (8) Tendency to throw all responsibility of records on the hospital. Pressure on the hospital has just reached the point of maximum tensity. Further advance will have to be made through interest in the cause on the part of the medical profession at large."

DIAGNOSTIC AND THERAPEUTIC FACILITIES IN HOSPITALS

It is clearly evident that hospitals have greatly increased their interest and their activities in diagnostic and therapeutic departments. These departments with their various branches of services are extremely essential in assisting the doctor to make or to confirm his diagnoses.

Clinical laboratory. The main speaker on this subject summarized his remarks as follows: "The personnel of the hospital laboratory should consist of a clinical pathologist in charge, a young physician in training for clinical pathology, and as many technicians as the work of the institution may require. It should be located adjacent to the operating room, preferably on the top floor, with a northern exposure, and subdivided into five rooms, including a private office for the clinical pathologist. The equipment should be adequate for the carrying on of all of the necessary tests in clinical microscopy, pathological histology, bacteriology, serology, and chemistry. As a matter of routine, the laboratory department should determine the condition of the blood and urine of all patients entering the hospital, and write into the records of the institution the results of histological examination of all tissues removed at operation. A Wassermann test should also be done as a matter of routine, at least upon chronic cases. The clinical pathologist should be freely employed as a consultant by the staff, and it should be considered his privilege and duty to perform any tests which, in his judgment, might throw light on the condition of any patient. The activities of the hospital laboratory should be confined to the institution alone, unless it happens to be the only available center of clinical pathology in the community."

The essayist did not venture a satisfactory method of financing laboratories, stating that this problem was a matter for future solution. During the meeting, however, the question of financing laboratory service came up on several occasions. There are apparently many methods in vogue for making charges today. The following were mentioned: (1) a schedule of prices at so much per test or examination; (2) a flat-rate fee, covering all the laboratory work required; (3) the addition of a certain amount to the per diem charge made to the patient, so as to cover all laboratory service; (4) a free service, as might be found in a hospital having an endowed laboratory or supported entirely by the state. Opinion appears divided as to the most generally desired method of making charges. A compromising suggestion, worthy of note, was that there should be a flat charge for such routine tests as urinalyses, blood counts, smears, and possibly Wassermann tests; the rest to be charged for according to a schedule adopted by the hospital. The charges made should not embarrass the service by limiting the use of the laboratory.

X-ray department. This is a very important diagnostic and therapeutic department nowadays in hospitals. It is, indeed, a rare thing to find a hospital without an X-ray service. The rapid development, however, needs more words of caution and warning lest the quality of service deteriorates. The principles of development and management are much the same as in the case of the clinical laboratory. The main speaker on this subject brought out all the facts concerning the efficient operation of this service in any hospital. Some of the more outstanding features which were referred to may be summarized as follows: The personnel of the X-ray department should consist of a radiologist who should be in charge. This should be a medical man, preferably one of clinical ability and experience. It is always advisable, if possible, to have a young physician in training as an understudy. There should be as many technicians as the work of the institution may require. The X-ray should be located adjacent to the operating room, so as to promote good team-work between the surgeon and the radiologist. There should be sufficient floor space to provide for at least a waiting room and office, and view, operating, fluroscopic, filing, and developing rooms. The equipment must be adequate for carrying on radiographic and fluoroscopic work, as well as doing superficial and deep

therapy where deemed advisable. All interpretations must be done by a competent medical radiologist. A record of the work should be kept in the department and a duplicate copy sent up to the ward to be attached to the patient's file. Radiologists should be freely employed as consultants to the staff and should attend the staff meetings. It should be his privilege and duty to make any X-ray examination which, in his judgment, might throw light on the condition of the patient. The activities of the department, like the clinical laboratory, should be confined to the institution alone, unless it happens to be the only available X-ray in that community.

In addition to all that has been referred to in this very inadequate presentation or review, there was valuable discussion of twenty-two important topics in the round table conference, which threw particular light on numerous problems troubling the hospital representatives who came to the meeting, a full report of which will appear in a bulletin early in the year.

INDIANA AND ONTARIO AND QUEBEC SECTIONAL MEETINGS OF THE CLINICAL CONGRESS OF AMERICAN COLLEGE OF SURGEONS

INDIANA

THE sectional meeting of the American College of Surgeons for the state of Indiana was held in Fort Wayne on November 14–15. Headquarters and registration rooms were at the Anthony Hotel. Clinics were conducted on both days at St. Joseph's Hospital.

The hospital conference was held in the ballroom of the Anthony Hotel at 2:00 p.m. on November 14. Dr. A. E. Bulson, chairman of the Indiana state committee, presided. Following this meeting an illustrated address on the "Activities and Organization of the American College of Surgeons." was given by one of the associate directors.

The following state committee was elected for next year:

Chairman—Dr. Edmund D. Clark, Indianapolis
Secretary—Dr. E. E. Padgett, Indianapolis
Counselor—Dr. Stanley A. Clark, South Bend

The community health meeting was held in the Majestic Theatre and long before the time for the opening of the meeting the theatre was packed and there was standing room only. The audience was extremely interested and enthusiastic. The attendance was approximately eighteen hundred.

The scientific meeting was held in the ballroom of the Anthony Hotel at 2:00 o'clock on the afternoon of the second day. At this meeting illustrated addresses were given by Dr. Nelson M. Percy of the Ochsner Clinic, Chicago, on "Blood Transfusion" and Dr. James T. Case of the Battle Creek Sanitarium, Battle Creek, on "Intestinal Diverticulosis."

The preliminary arrangements for these meetings in Fort Wayne were exceedingly well carried out. The local Fellows of the College are to be congratulated.

The visiting speakers were: Dr. A. J. Ochsner, Chicago, president of the American College of Surgeons; Dr. Franklin H. Martin, Chicago, director general of the American College of Surgeons; Dr. George Crile, Cleveland; Dr. James T. Case, Battle Creek; Dr. Nelson M. Percy, Chicago; Dr. Malcolm T. MacEachern, Chicago; Dr. Allan Craig, Chicago; Rev. C. B. Moulinier, S.J., Milwaukee; and Rev. F. C. English, Cleveland.

ONTARIO AND QUEBEC

The sectional meeting of the American College of Surgeons for the provinces of Ontario and Quebec was held in Ottawa, Canada, on November 22 and 23. The headquarters for this meeting was at the Chateau Laurier. Clinics were conducted at St. Luke's Hospital, Protestant General Hospital, and Ottawa General Hospital.

The hospital conference was held in the ballroom of the Chateau Laurier on the afternoon of the first day. There was a large audience which filled the ballroom to overflowing and the program was excellently arranged and well received. Dr. A. T. Shillington, chairman of the Ontario committee, presided at the sessions.

Following the hospital conference an illustrated address on "The Organization and Work of the American College of Surgeons" was given by one of the associate directors and the following provincial committees were elected for the coming year:

ONTARIO

Chairman—L. J. Austin, Kingston
Secretary—Charles A. Young, Ottawa
Counselor—Frederick B. Mowbray, Hamilton

QUEBEC

Chairman—W. W. Chipman, Montreal
Secretary—Eugene Saint-Jacques, Montreal

The community health meeting was under the patronage of Their Excellencies Lord and Lady Byng, who occupied seats upon the platform. The meeting was held on the evening of the 22nd in the Auditorium of the new Collegiate Institute on Carling Avenue. The Auditorium was crowded to the doors and there was standing room only. Music was provided by the Collegiate Institute Orchestra. They played while the audience was being assembled and during the showing of the moving picture film, "The Reward of Courage," at the close. This was a very interesting and enthusiastic meeting and one of the best which the College has had. The attendance was at least seventeen hundred.

The scientific meeting was held in the ballroom of the Chateau Laurier on the afternoon of the 23rd. There was a very large attendance and an exceedingly interesting program.

The hospital clinics were splendidly organized and well carried out.

The visiting speakers were: Dr. W. W. Chipman, Montreal; Dr. Franklin H. Martin, Chicago; Dr. George W. Crile, Cleveland; Dr. James T. Case, Battle Creek; Rev. C. B. Moulinier, S.J., Milwaukee; Dr. F. N. G. Starr, Toronto; Dr. L. J. Austin, Kingston; Dr. Oscar Klotz, Toronto; Sir Henry Gray, Montreal; Dr. C. B. Keenan, Montreal; Dr. Harry Burgess, Montreal; Dr. A. K. Haywood, Montreal; Dr. Malcolm T. MacEachern, Chicago; and Dr. Allan Craig, Chicago.

The local Fellows of the College are certainly to be congratulated upon the exceedingly successful meeting held in Ottawa.

On Saturday, the 24th, following the sectional meeting, the director general, Dr. Franklin H. Martin, addressed the Canadian Club at the Chateau Laurier.